Vol. 22 JUNE, 1936 No. 6

International Journal of Orthodontia and Oral Surgery

Published by The C. V. Mosby Company, 3523-25 Pine Blvd., St. Louis, U. S. A.

International Journal of Orthodontia and Oral Surgery

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Vol. 22, No. 6, June, 1936. International Journal of Orthodontia and Oral Surgery is published by The C. V. Mosby Company, 3523 Pine Blvd., St. Louis, Mo. Subscription Price: United States, its Possessions, Pan-American Countries, $7.00; Canada, $7.50; Foreign, $8.50. Entered as Second-Class Matter at Post Office at St. Louis, Mo., Under Act of March 3, 1879.

International
Journal of Orthodontia
and Oral Surgery

VOL. 22 JUNE, 1936 No. 6

Orthodontia

VARIOUS TYPES OF OCCLUSION AND AMOUNTS OF OVERBITE IN NORMAL AND ABNORMAL OCCLUSION BETWEEN TWO AND TWELVE YEARS

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THE phenomenon of dental overbite is one of common observation. With the teeth in occlusion, which here signifies "the relationship of the teeth of the maxilla and mandible when the jaws are closed and the condyles are at rest in the glenoid fossae,"* the maxillary incisors are normally, in the white race, at least, horizontally in front of and vertically overlapping the corresponding teeth of the mandible. This condition refers especially to the incisal edges. Both horizontal and vertical overbite, however, vary in extent; and it is this variation, often occurring to an excessive degree, that has been of interest to the general dental practitioner and of special significance to the orthodontist.

The usual mode of expressing variations in overbite has hitherto been by means of descriptive terms such as "slight," "marked," "abnormal," etc., and by illustrating with models the conditions cited. This procedure has long seemed inadequate to us. How much is "slight" or "much"? What is actually the extent of overbite in normal occlusion? in the various types of malocclusion? What is the range of variation in each? With reference to age? Questions such as these are obviously pertinent, yet have never, to our knowledge, been examined by actual mensuration. This task will be attempted in the following contribution. The closest approach in this direction as far as we are aware has been a study by Shaw[5] on vertical overbite in which the extent of overlapping was approximated by inspection.

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*This definition of occlusion is quoted by Friel.[3]

In the process of organizing the data for the purpose of dealing with overbite, advantage was taken of the detailed information available in each case regarding occlusion and bite.* It was felt that a survey of the incidence of malocclusion and (to our minds of equal import) the various types of malocclusion with reference to bite at the several ages between 2 and 12 years would be a valuable complement to the quantitative treatment of overbite; especially since the latter is in many, if not most, cases directly correlated with the type of bite possessed.

MATERIAL

The material utilized in the present study comprises 831 plaster of Paris dental impressions representing 306 children between 17 months and 12 years of age. A number of the children had impressions taken at yearly intervals over a period of two and six years, thus accounting for the discrepancy between number of casts and number of children. The children, excepting a very few, are of

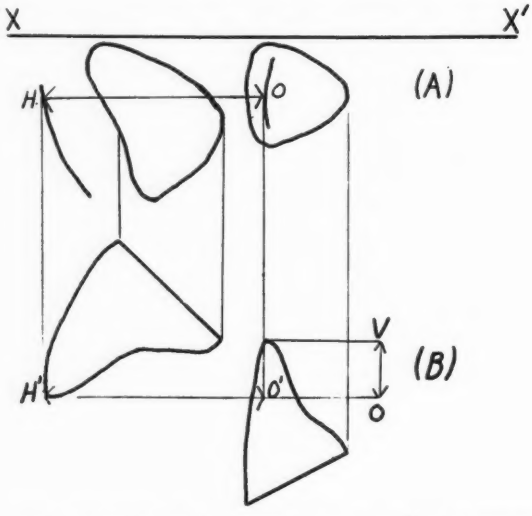


Fig. 1.—*A*, Horizontal projection of left maxillary mandibular central incisors. Horizontal overbite (H - O) is the distance between the center of the incisal edge of the mandibular incisor and the incisal edge of the maxillary incisor, drawn parallel to the axis of the denture (X - X').

B, Projection in sagittal plane of same incisors. Vertical overbite (V - O) is the difference in elevation between the incisal edges of the maxillary and mandibular incisors. H' - O' shows horizontal overbite in this plane.

native birth and largely of parents born in America. There was no deliberate selection with regard to type of occlusion, subjects with normal and abnormal occlusion being observed as they presented themselves. The economic level of the group as a whole is probably somewhat better than the average, since the greater number of parents were of the professional class. It is considered doubtful, however, that this fact has had any appreciable effect on the results to be presented. Malocclusion is notoriously prevalent in all economic groups.

METHOD

Landmarks of measurement were the incisal edges of the left maxillary and mandibular central incisors, respectively (Figs. 1 and 2). The method of ascertaining horizontal and vertical overbite, respectively, was as follows.

*The "bite," as used in the present study, refers to the kind of interrelationship of the maxillary and mandibular teeth in local sections of the dental arch.

Maxillary and mandibular dental casts, in occlusion, were placed on the levelling table of the Stanton pantograph[6] and orientated in the occlusal plane, i.e., that horizontal plane relative to which every maxillary tooth not a molar extends below as far as the corresponding mandibular tooth extends above it. The dentition was thereupon orthographically projected, five times enlarged. It is to be emphasized that the projected figures depicted the dentition in occlusion precisely as set upon the levelling table.

The horizontal overbite could now be determined on the projected figure, being the linear distance between the middle of the incisal margin of the left mandibular central incisor and the incisal margin of the corresponding maxillary tooth, taken parallel to the axis of the dentition (Fig. 1*A*).

Vertical overbite was determined on the model proper while resting in occlusion and properly orientated on the levelling table of the pantograph. A sliding pointer on an elevation scale, perpendicularly fixed over the levelling table, gave heights to the incisal edge of maxillary and mandibular (left) central

Fig. 2.—The actual model from which the diagram in Fig. 1 was made.

incisor, respectively, the difference between the two obviously representing the extent of vertical overlapping between maxillary and mandibular incisors (Fig. 1*B*).

CLASSIFICATION OF OCCLUSION

The dentitions examined exhibited, of course, normal and abnormal occlusion, and since the group was essentially a random sample with respect to occlusion, the incidence of malocclusion should prove substantially typical of

TABLE I

PERCENTAGE OF MALOCCLUSION BETWEEN TWO AND TWELVE YEARS

	2	3	4	5	6	7	8	9	10	11	12
	(45)*	(108)	(135)	(128)	(100)	(99)	(86)	(59)	(35)	(19)	(8)
Malocclusion	55.6	45.4	43.0	43.0	57.0	70.7	79.1	83.1	82.9	78.9	100
Class I	33.3	27.8	29.5	27.4	39.0	57.4	67.5	69.5	71.4	68.4	100
Class II	22.2	17.6	13.3	14.9	17.0	13.1	11.7	13.6	11.5	10.6	–
Class III	–	–	–	0.8	1.0	–	–	–	–	–	–

*Figures in parentheses refer to total number of cases (normal and abnormal occlusion).

the general population within the ages considered. Table I presents the relative frequency of malocclusion between 2 and 12 years, and also, for the purpose of

comparison, the incidence of malocclusion in German children noted separately by Korkhaus[4] and Thielemann[7] is given in Table II.

Malocclusion is evidently very prevalent even at two years of age. Particularly interesting is the rather appreciable drop in the incidence of malocclusion at three, and to a lesser extent, at four years of age. In part, at least, this general improvement in occlusion is very likely due to the decrease of certain types of abnormalities (open-bite, protrusion of maxillary incisors) caused by thumb-sucking, a common habit of infancy.

A striking illustration of this point is the result of a recent survey of dental occlusion in an orphan asylum. No less than 51 per cent of 49 boys between 2½ and 3½ years had been or were at the time of observation chronic thumb-suckers; over 28 per cent, all within the latter group, exhibited open-bite typical of thumb-sucking. Two years later, at the age of 4½ to 5½ years, the proportion of thumb-suckers, i.e., those still continuing the habit, had dropped to 5.2 per cent (of 38 children), the same percentage manifesting the open-bite type of malocclusion. The very excessive proportion of children with open-bite in the younger group is probably exceptional; yet the definite trend toward improvement, even virtual elimination, of deformities caused by thumb-sucking, some time after correction of the habit, can hardly be denied.

Returning to Table I, it is noted that at 6 and 7 years of age when the molar and incisors of the permanent dentitions are being acquired, a marked increase in frequency of malocclusion occurs, until at 11 years some form of abnormality is present in more than three-fourths of all dentitions.

TABLE II

COMPARATIVE RATIOS OF MALOCCLUSION

		PERCENTAGE			
		MALOCCLUSION	CLASS I	CLASS II	CLASS III
Authors	(2-12 yr., 822 cases)	58.8	43.9	14.6	0.2
Thielemann	(? cases)	48.7	42.0	4.3	2.4
Korkhaus	(6 yr., 643 cases)	43.1	33.1	7.2	2.8
Korkhaus	(14 yr., 568 cases)	55.4	41.7	13.2	0.5

The total incidence of malocclusion between 2 and 12 years is compared with the observations of Thielemann and Korkhaus (Table II). The former obtained his data on the deciduous dentition, the latter on children at 6 and 14 years, respectively.

Malocclusion appears to be somewhat more common in American children; although the figures are really in fairly close agreement considering the probably different methods of classifying cases as normal or abnormal. It is of interest to note that Korkhaus' data also indicate an appreciable increase in the incidence of malocclusion between 6 and 14 years of age.

The incidence of malocclusion in males and females in the present study is much the same (♂ 52.2 per cent, ♀ 49.7 per cent). Korkhaus also comments on the lack of significant difference between the sexes regarding frequency of malocclusion (6 yr. ♂ 42.1 per cent, ♀ 44.2 per cent; 14 yr. ♂ 57.4 per cent, ♀ 53.7 per cent—loc. cit., p. 122). Analysis of bite according to sex in our

article also manifested close approximation between the sexes. For this reason, and in order to secure as numerically large groups as possible to represent the various forms of malocclusion, the data for the two sexes have been combined and will be so presented in the remainder of our discussion.

In Table II is also tabulated the distribution of types of malocclusion according to the well-known classification of Angle.* It will be recalled that this classification was based on the anatomical mesiodistal relationship of the maxillary and mandibular side teeth (cuspid and teeth posterior thereto), his classes having reference to (I) all disturbances in the dental alignment in which the aforementioned mesiodistal relationship of the maxillary-mandibular side teeth was not involved or was involved to a limited extent,† (II) the mandibular side teeth being in distal relationship to the corresponding maxillary teeth, and (III) the mandibular side teeth being in mesial relationship to the corresponding maxillary teeth.

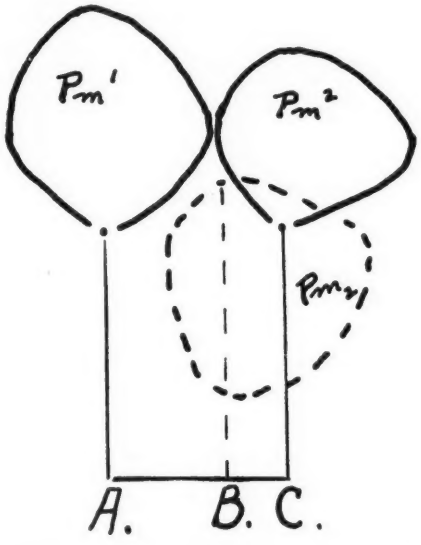


Fig. 3.—Normal relationship of the cheek teeth is illustrated by the occlusion of mandibular second with the maxillary first and second premolars. The buccal cusp of mandibular second premolar (B) may occlude anywhere between the corresponding cusps of the maxillary first premolar and second premolar, represented by lines A and C, and still be considered in Class I of Angle's classification. Location of B anterior to A is regarded as Class III, and B posterior to C as Class II.

To return to the tabular data, cases with Class I malocclusion are clearly seen to be the most prevalent and those in the Class III category the least common, an observation with which the orthodontist is well acquainted as a result of clinical experience. Of some interest, however, is the great increase in the predominance of Class I malocclusion at 6 years, and the progressive continuity of this increase until 12 years. Somewhat contrary to expectation, Class II mani-

*Angle, E. H., Malocclusion of the Teeth. 1907, Philadelphia. In his book, Angle takes the permanent first molars only, apparently, as the basis for his mesiodistal relationship of maxillary and mandibular teeth. This condition obviously could not apply in the deciduous dentition, and as a matter of fact, in the course of personal teaching, to the recollection of one of the writers (Stanton) who was a student under Angle, he, Angle, affirmed that not only the first molar but the canines and all the teeth posterior thereto should be considered in the classification of malocclusion.

†The mesiodistal relationship might be disturbed up to and including an edge-to-edge contact of maxillary and mandibular cusps, instead of the normal cusp and fossa (or groove) relationship—without, however, changing the classification. The point is considered important and is illustrated in Fig. 3.

fests the opposite trend in the present material, diminishing some 50 per cent in relative frequency between 2 and 11 years. It is possible that the proportion of Class II in the younger age groups was unusually high, becoming more "normal" in the older groups. Yet, it is also to be remembered that the present material consists chiefly of children with the deciduous dentition, and that in the transition to the permanent dentition the incidence of Class II might conceivably rise as it did between 6 and 14 years in Korkhaus' observations.

Combining all age groups (2 to 12 years), it is seen in Table II that the prevalence of Class I in the present series is not much different from that appearing in the observations of Korkhaus and Thielemann. Regarding Class II, however, an appreciably higher incidence apparently occurs in our group than in the German children. Differences in methodology of classification, or the not unlikely possibility that the incidence varies in different populations, may account for the discrepancy. The Class III category is a comparatively negligible one according to all observers, although it seems especially so in the present group.

Mention may be made that Korkhaus calculates the proportion of cases in the three classes of Angle as the percentages of malocclusion only, not of the whole series, i.e., the combined normal and abnormal groups. He thus obtains, at 6 years, 77.2 per cent in Class I, 16.6 per cent in Class II, and 6.2 per cent in Class III; at 14 years, 75.2 per cent in Class I, 23.8 per cent in Class II, and 1.0 per cent in Class III. The present data when so considered yield 74.7 per cent in Class I, 24.8 per cent in Class II, and 0.5 per cent in Class III—evincing, as also appears in Table II, close similarity to Korkhaus' data at 14 years. Indeed, Brash[2] has obtained from data presented by the Medical Research Council's Committee for the Investigation of Dental Disease in 1925—in which 4,170 children of both sexes, ranging in age from 2 to 15 years, were examined—an incidence of 21.85 per cent with postnormal or Class II malocclusion; and 1.35 per cent prenormal or Class III malocclusion (p. 21). These ratios are manifestly very close to the ratios obtained by Korkhaus and by us.

CLASSIFICATION OF BITE

Gross division of occlusion into normal and abnormal categories, or even subdivision of malocclusion into Angle's Classes, did not seem to us adequate in the elucidation of overbite. There are of course many and distinctly different types of malocclusion. Moreover, with regard to Angle's classification, his Class I includes such opposite conditions as open-bite and marked vertical overbite, excessive protrusion of the maxillary incisors relative to the mandibular incisors, and protrusion of the mandibular incisors beyond the corresponding maxillary teeth. To a lesser extent, this too-inclusiveness, as it were, is also true of Class II. Indeed, recognition of this very situation by Angle is evident in his divisions of Class II in which the anterior bite is clearly the criterion; division 1 comprising cases in which there is considerable protrusion of the maxillary incisors and division 2 comprising individuals with no or little horizontal overbite, usually accompanied by a lingual inclination of the maxillary incisors.

As a matter of fact, even normal occlusion exhibits a relatively wide distribution of type, ranging from an approach to the ideal anatomically perfect occlusion (which is rarely if ever observed) to the borderline of malocclusion with respect to horizontal and vertical overbite.

In view of these considerations, especially with reference to overbite, the present data have been segregated according to type of bite as indicated in Table III. Korkhaus has also contributed valuable data on the various types of bite in malocclusion, and it may be mentioned that, to our knowledge, his and Shaw's are the only statistical compilations previously made on this important subject. The data of Korkhaus which were deemed comparable have been included in Table III and will be discussed subsequently.

TABLE III

PERCENTAGE OF VARIOUS BITES IN NORMAL AND ABNORMAL OCCLUSION BETWEEN TWO AND TWELVE YEARS

BITE	AGE IN YEARS 2	3	4	5	6	7	8	9	10	11	12	WRITERS (2-12 YR.)	KORKHAUS (6 YR.)	KORKHAUS (14 YR.)
						Normal Occlusion								
(a)	20.0	29.6	29.6	33.6	23.0	14.1	8.1	6.8	5.7	5.3	–	21.3		
(b)	–	–	–	–	–	–	–	–	–	–	–	–		
(c)	13.3	15.7	13.3	7.8	6.0	5.1	4.7	1.7	2.9	–	–	8.3		
(d)	11.1	9.3	14.1	15.6	14.0	10.1	8.1	8.5	8.6	15.8	–	11.7		
Class I						*Abnormal Occlusion*								
(e)	–	–	0.7	2.3	8.0	10.1	11.6	13.6	11.4	10.5	25.0	5.8		
(f)	4.4	2.8	5.2	4.7	6.0	4.0	4.7	5.1	5.7	5.3	–	4.6	3.9	1.6
(g)	–	0.9	0.7	0.8	1.0	–	–	–	–	–	–	0.5		
(h)	–	2.8	2.2	0.8	3.0	4.0	3.5	6.8	11.4	5.3	–	3.2	1.7	4.1
(i)	17.8	13.0	7.4	10.2	7.0	16.1	18.6	16.9	14.3	10.5	25.0	12.5	12.5	5.6
(j)	6.7	3.7	5.2	3.9	10.0	18.2	27.9	27.1	28.6	36.8	50.0	13.1		
(k)	–	0.9	–	–	–	–	–	–	–	–	–	0.1	5.6	0.4
(l)	4.4	2.8	7.4	3.9	2.0	2.0	–	–	–	–	–	2.9	4.0	2.3
(m)	–	0.9	0.7	0.8	2.0	3.0	1.2	–	–	–	–	1.1		
Class II														
(e)	–	0.9	–	0.8	–	–	–	–	–	–	–	0.2		
(f)	2.2	–	–	–	–	–	–	–	–	–	–	0.1		
(h)	–	–	0.7	0.8	2.0	1.0	–	–	–	–	–	0.6	0.8	1.6
(i)	8.9	7.4	5.2	7.0	5.0	5.0	4.7	5.1	2.9	5.3	–	5.7	5.1	5.3
(j)	11.1	9.3	7.4	6.3	10.0	7.1	7.0	8.5	8.6	5.3	–	7.9		
(l)	–	–	–	–	–	–	–	–	–	–	–	–	–	0.2
Class III														
(m)	–	–	–	0.8	1.0	–	–	–	–	–	–	0.2	2.6	0.5

Note.—Number of cases for each age is given in Tables I and II.

The small letters, as indicated below, refer to the type of bite.

Normal Occlusion:

(a) Good horizontal and vertical overbite.
(b) Too much vertical overbite.
(c) Too much horizontal overbite.
(d) Too much vertical and horizontal overbite, combined.

Abnormal Occlusion:

(e) Good bite, anteriorly.
(f) Cross-bite in anterior region (not including both central incisors), without much affecting the overbite, horizontal or vertical.
(g) Open-bite in buccal region (premolar or deciduous molars), without much affecting the anterior horizontal or vertical overbite.
(h) Excessive vertical overbite.
(i) Excessive horizontal overbite.
(j) Excessive vertical and horizontal overbite, combined.
(k) Edge-to-edge bite.
(l) Open-bite of the incisors.
(m) Cross-bite of both central incisors (protrusion of the mandibular incisors in front of the corresponding maxillary teeth).

Surveying normal occlusion first, we note with some surprise the high proportion of cases manifesting too much horizontal and vertical overbite. Indeed, although the percentages in both good and faulty bite categories decrease with age, the rate of decrease is so much faster in the former that faulty bite becomes more prevalent at 7 years, and at 10 and 11 years is predominant. Also of interest is the evidence that in normal occlusion too much vertical overbite is always associated with too much horizontal overbite.

Turning to cases with malocclusion, the material was arranged, as mentioned above, according to distinct types of bite, separated under the three classes of Angle. The results are of considerable interest. Surprisingly an appreciable proportion of cases especially in Class I exhibits good bite (e), albeit for one reason or another classified in the abnormal category (rotation of incisors, lingual or buccal eruption of teeth, etc.). Moreover, and rather unexpectedly, the incidence of good bite apparently tends to increase between 2 and 12 years. The most likely explanation for this situation it seems to us is that, in the first place, malocclusion due to a habit like thumb-sucking definitely tends to improve with age, and second, cases with normal occlusion and good bite in the deciduous dentition, upon eruption of the permanent first molars and incisors at about 6 years, and the other permanent teeth subsequently, become liable to rotations and other irregularities in these teeth without appreciably impairing the original good bite.

Attention may be directed to the fact that excessive horizontal overbite and especially combined excessive horizontal and vertical overbite which here, too, seems definitely correlated, are by far the most common symptomatic forms of malocclusion. Especially in the Class I category do these latter types manifest a marked and virtually progressive rise in prevalence between 2 and 12 years.

Open-bite (l)* in the present group is observed to disappear after the seventh year. The incidence of mandibular incisor protrusion (m) is seen to be very slight, even when combining cases in Class I and Class III. The incidence of edge-to-edge bite (k) is unusually low. Cross-bite of the lateral incisors or one of the central incisors (f) apparently remains essentially unchanged in relative frequency in the deciduous dentition; cross-bite of the side teeth (g) appears very uncommon in the present material.

In short, much variability is noted in the prevalence of each type of bite from age to age. Korkhaus had assumed that, inasmuch as his older group (14 years) exhibited a smaller frequency of certain types of bite and a greater incidence in other types, as compared with his younger group (6 years), there were forms of malocclusion which were self-corrective, and other forms which became markedly more prevalent with age. This view is fully corroborated in the present investigation.

The data of Korkhaus on types of bite, given in Table III, have been modified somewhat in order to conform to the arrangement in the present paper. Two major classifications made by Korkhaus, namely, "shortening of lower and upper arch by premature extraction" and "upper constriction and frontal crowding" were necessarily excluded since, regrettably, there were no subdivisions comparable to those mentioned in our presentation.

*Open-bite not infrequently was associated with excessive horizontal overbite, but such cases were considered in the open-bite category only.

Combining the present data between 2 and 12 years, which still constitutes essentially the deciduous dentition, our results, on the whole, agree remarkably well with the observations of Korkhaus on his six-year-old group. The main differences apparently are a somewhat greater proportion of edge-to-edge bite and mandibular incisor protrusion in Korkhaus' material.

DISCUSSION

A survey of the several classes of malocclusion according to Angle and of the various types of bite within these classes serves to emphasize the fact that the first, and most common, disturbance in occlusion or the dental alignment occurs in the anterior region of the dentition. As a matter of fact, even in normal occlusion there has been noted a definite trend for faulty anterior overbite, horizontal and vertical. Indeed, the manner in which this trend became increasingly more prevalent with age in normal occlusion, and in view of the fact that too much horizontal or vertical overbite merges into the excessive category and therefore in the malocclusion class, suggests that this type of bite in normal occlusion might well be an index of impending future malocclusion.

The material has likewise demonstrated, as already intimated, that in the classification of malocclusion the mere statement of the Angle Class, as is commonly done, is a very inadequate procedure, considering the many and divergent types of bite within each of the Class I and Class II categories, respectively. A method of classification in which recognition of types of bite was made in conjunction with the Angle Class would seem to be much more meaningful. Furthermore, it has become evident that when speaking of the incidence of malocclusion the factor of age must also be kept in mind; certainly between 2 and 12 years in the present material, and as indicated by Korkhaus at 6 and 14 years respectively, there occur appreciable fluctuations in relative frequency and in types of malocclusion.

As a matter of fact, designation of the kind of bite present and knowledge of the age of the individual may well suggest the etiology of the observed malocclusion; something which a mere use of the Angle classification, helpful though it undoubtedly is, can hardly do, certainly not the most prevalent Class I type. Examples in which there is a connotation of etiology are: open-bite, especially in childhood, usually the result of thumb-sucking; cross-bite in the side region, not infrequently due to sleeping habits, the cheek being propped on the fist; excessive horizontal overbite in the adult, suggestive of a discrepancy in the growth pattern in the anterior region of the mouth; and so forth.

Cases with malocclusion due primarily to environmental causes could be segregated, and all others might be investigated with reference to the likelihood of heredity being involved. Mention may be made, as intimated previously, that the present material suggests that an appreciable proportion of all malocclusion is primarily the result of environmental factors. Open-bite, protrusion of the maxillary incisors, cross-bite, and the like, can definitely be associated with habits in early childhood (e.g., thumb-sucking, sleeping and propping habits, etc.); upon cessation of the habit the malocclusion often becomes, without treatment, substantially or totally corrected. Later on in youth premature loss of teeth unquestionably induces shifting of the teeth and attendant malocclusion of

various types. A large percentage of malocclusion due to such local causes undoubtedly falls in Angle's Class I, and it is to be recalled that this Class comprises over 70 per cent of all malocclusions. Moreover, where a disturbance in the mesiodistal relationship of the whole dental arch is involved, namely, Angle's Class II and Class III, the latter becomes less frequent with age according to both Korkhaus' and the present data, as does apparently even the Class II type between 2 and 12 years. Hence, self-correction apparently does occur in Class III and even in Class II, which would scarcely be expected in malocclusion due to fixed, inherent patterns of structure. The factor of heredity, however, is undoubtedly the direct cause of malocclusion in specific instances, and, as Brash points out (loc. cit., p. 246), adequate investigation in this field is lacking, and is much needed.

QUANTITATIVE EXTENT OF OVERBITE

The quantitative extent of vertical and horizontal overbite has been examined with regard to age, type of occlusion, and the presence of deciduous or permanent incisors. Concerning the factor of occlusion, the usual method of indiscriminately merging all types of malocclusion in one abnormal category was considered an objectionable procedure for reasons already elaborated upon. On the other hand, fine grouping of the present data according to the subdivisions made in Table III, however much desired, was impractical in a quantitative analysis of overbite, simply because of the numerical scarcity in a number of the categories, and the fact that fairly large numbers of observations are essential to insure reliability in any consideration of averages. Hence, in an attempt to avoid the possibility of neutralizing significant differences by gross classification and yet work with numerically representative groups, the following compromise in procedure was adopted.

1. Normal occlusion was divided into two major categories, namely, cases with (A) good bite (a)*; and (B) faulty bite (b, c, d).

2. Malocclusion was divided into five major groups, namely, (C) cases in which the vertical or horizontal overbite was not materially affected (e, f, g in Angle's Class I); (D) cases manifesting excessive vertical or horizontal overbite in Angle's Class I (h, i, j, k). The k, or edge-to-edge bite, was inadvertently included in the calculations of this group; since, however, only one case of this type occurs in the present material, the effect of its inclusion in this group will obviously be negligible; (E) open-bite in the incisor region (l); (F) all of Angle's Class II; (G) cases with protrusion of the mandibular incisors beyond the incisal margins of the corresponding maxillary teeth (m, in Class I and Class III).

Cases with open-bite of the incisors due to the teeth not being sufficiently erupted were omitted from all the calculations.

A combination of cases manifesting only excessive horizontal overbite with others exhibiting excessive vertical overbite only, might seem objectionable from the very point of view previously expressed, namely, that indiscriminate inclusion of various types of occlusion in one category may mask important distinctions latent in the data. This objection in the present instance, however, seems

*The small letters refer to the types of bite indicated in the legend of Table III.

to us much mitigated by the fact that excess vertical overbite is usually concomitant with excess horizontal overbite (Table III); hence, it was felt that the combination of all cases with "excess" overbite would not materially affect the averages in the separate horizontal and vertical categories. Moreover, this factor of "combining various types of occlusion" is eliminated later in an analysis of overbite according to metric criteria only.

Likewise Class II was taken as a unit despite the distinct differences in anterior bite in Division 1 and Division 2 of this Class. This was done because, first, the preponderant type of bite in Class II of the present material is the excess vertical and horizontal overbite; and second, as seen below, the actual number of Div. 2 cases is very small.

NUMBER OF CASES IN DIVISIONS 1 AND 2, ANGLE'S CLASS II (2-12 YEARS)

AGE (YR.)	2	3	4	5	6	7	8	9	10	11	12
Division 1	9	17	16	17	13	11	9	8	4	2	–
Division 2	1	2	2	2	4	2	1	–	–	–	–

Turning now to the question of amount of overbite in the several divisions of normal and abnormal occlusion, and with regard to age between one and twelve years, we observe the results in Tables IV and V, treating of horizontal and of vertical overbite respectively.

TABLE IV

AVERAGE OVERBITE (MM.) IN NORMAL AND ABNORMAL OCCLUSION

AGE (YR.)	HORIZONTAL OVERBITE A*	B	C	D	E	F	G	VERTICAL OVERBITE A	B	C	D	E	F	G
1	(5)†				(4)			(5)				(4)		
	2.7				4.8			1.7				2.0		
2	(9)	(11)	(2)	(11)	(10)	(2)	–	(9)	(11)	(2)	(10)	(9)	(2)	–
	3.0	3.1	2.2	4.3	5.1	2.8	–	1.8	2.2	1.1	2.0	2.8	–1.1	–
3	(32)	(27)	(5)	(21)	(19)	(3)	(1)	(32)	(26)	(4)	(21)	(18)	(3)	(1)
	2.5	3.3	1.8	4.5	5.3	4.6	–2.4	1.8	2.1	1.6	1.9	2.9	–1.4	3.0
4	(40)	(37)	(8)	(20)	(18)	(11)	(1)	(40)	(36)	(6)	(20)	(17)	(11)	(1)
	2.2	3.3	2.0	4.4	5.1	3.5	–1.2	1.4	2.3	1.3	1.9	3.2	–1.2	1.0
5	(43)	(30)	(10)	(19)	(19)	(5)	(2)	(40)	(27)	(9)	(17)	(17)	(4)	(2)
	2.1	3.4	2.3	4.0	5.5	3.8	–1.95	1.3	2.3	1.5	2.4	2.5	–2.0	2.2
6	(23)	(20)	(15)	(19)	(17)	(2)	(3)	(19)	(20)	(12)	(18)	(16)	(2)	(3)
	2.4	3.8	2.3	4.3	4.5	3.0	–2.4	1.1	2.5	1.6	2.5	3.0	–1.9	1.4
7	(14)	(15)	(14)	(38)	(13)	(2)	(3)	(13)	(15)	(14)	(37)	(12)	(2)	(3)
	2.4	3.4	2.3	3.9	5.7	3.6	–1.3	1.4	2.6	1.3	2.6	3.2	–4.2	0.7
8	(7)	(11)	(14)	(43)	(10)	–	(1)	(6)	(11)	(10)	(42)	(10)	–	(1)
	2.6	3.4	2.2	4.7	5.2	–	–1.0	2.1	3.1	1.6	3.4	3.2	–	0.6
9	(4)	(6)	(11)	(30)	(8)	–	–	(4)	(6)	(11)	(29)	(8)	–	–
	3.4	4.1	2.2	4.9	7.1	–	–	2.5	3.4	1.3	3.6	3.9	–	–
10	(2)	(4)	(6)	(19)	(4)	–	–	(2)	(4)	(6)	(19)	(4)	–	–
	3.9	3.3	2.7	5.0	8.2	–	–	3.3	3.7	1.9	3.7	3.5	–	–
11	(1)	(3)	(3)	(10)	(2)	–	–	(1)	(3)	(3)	(10)	(2)	–	–
	3.1	3.8	3.2	5.5	5.3	–	–	2.8	3.6	1.9	3.9	3.1	–	–
12	–	–	(2)	(6)	–	–	–	–	–	(2)	(6)	–	–	–
	–	–	2.3	5.4	–	–	–	–	–	1.9	3.4	–	–	–

*See text for legend to letters.

†Figures in parentheses refer to number of cases.

As would naturally be expected, appreciable differences in extent of horizontal protrusion and vertical overlapping of the maxillary incisors exist among the several divisions of occlusion. In normal occlusion the amount of overbite in the B or "faulty bite" group is considerably greater (horizontal and vertical)

than in the A or "good bite" category. Moreover, cases with malocclusion which upon inspection had indicated no material disturbance in the anterior overbite (C) show corresponding slight horizontal protrusion and vertical overlapping when actually measured, in this respect closely approximating the averages noted in "good bite" of normal occlusion. Indeed, in a number of instances the vertical overbite in the C category manifests averages even less than those observed, at corresponding ages, in normal occlusion. In this connection it will be recalled that the C division includes the cross-bite type of malocclusion, a condition which would in many cases actually impede vertical overlapping and hence account in large measure for the discrepancy in average vertical overbite noted in this group as compared with the "good bite" of normal occlusion.

TABLE V

RANGE (MM.) OF OVERBITE IN NORMAL AND ABNORMAL OCCLUSION

	NORMAL		ABNORMAL			
	A	B	C	D	E	F
Horizontal						
Deciduous	0.3-4.4	2.3-4.7	0.0-3.0	2.4- 8.2	1.5-11.2	0.6-6.0
Permanent	0.9-4.5	1.5-5.7	0.8-3.9	1.8-10.1	2.2-11.9	2.0-5.2
Vertical						
Deciduous	0.0-3.1	0.3-3.9	0.0-3.3	0.2- 5.0	0.0- 5.5	–0.2–4.0
Permanent	0.2-3.5	0.1-4.9	0.0-4.0	0.0- 6.6	0.6- 5.0	–1.0–6.3

The average dimensions of horizontal overbite in D (the "excess" category in Angle's Class I), as would be expected, are comparatively large, ranging from 22 per cent to 50 per cent greater than the averages at corresponding ages in the "good bite" category of normal occlusion. Interestingly enough, E, comprising the whole of Angle's Class II, manifests even more marked average maxillary incisor protrusion than occurred in the distinctly excessive group (D) in Angle's Class I. The relative excess in E ranges from 41 per cent to 62 per cent greater than occurs in "good bite" of normal occlusion, at corresponding ages. This somewhat more marked protrusion in Class II is readily understood when it is recalled not only that excess horizontal overbite is actually predominant in this class, but also that Class II malocclusion signifies a shift of the whole mandible backward relative to the maxilla, on one or both sides; whereas it is largely the anterior region only which is affected by the excessive overbite in those cases classified under Class I.

Little can be said regarding F and G (open-bite and protrusion of the mandibular incisors, respectively), since, regrettably, the averages are based on too few cases to be reliable.

The relationship of overbite to age may perhaps best be observed graphically in Fig. 4. Both horizontal and vertical overbite in "good bite" of normal occlusion diminish somewhat between 2 and 5 or 6 years, and then gradually show more or less of a continuous increase. Especially the D and E, however, indicate distinctly rising curves, both in vertical and in horizontal overbite. It would seem therefore that, although the incidence of Class II malocclusion apparently diminishes with age between 2 and 12 years (Table I), the severity of the malocclusion in those cases remaining in this Class, so far as horizontal and vertical overbite are concerned, becomes increasingly worse.

Cognizance should also be taken at this point of the fact that at 8 years the permanent central incisors have usually fully erupted, and, inasmuch as the permanent teeth are larger than the deciduous, the amount of overlapping in the former would presumably necessarily be greater in order to cover the same proportion of tooth as was covered in the deciduous dentition. However, the subject of deciduous and permanent teeth as related to overbite will be dealt with more fully later in our discussion.

The total increments, absolute and relative, in horizontal and vertical overbite between 3 and 9 years (the latter age intervals being taken on account of more adequate representation therein) are given below for each type of occlusion.

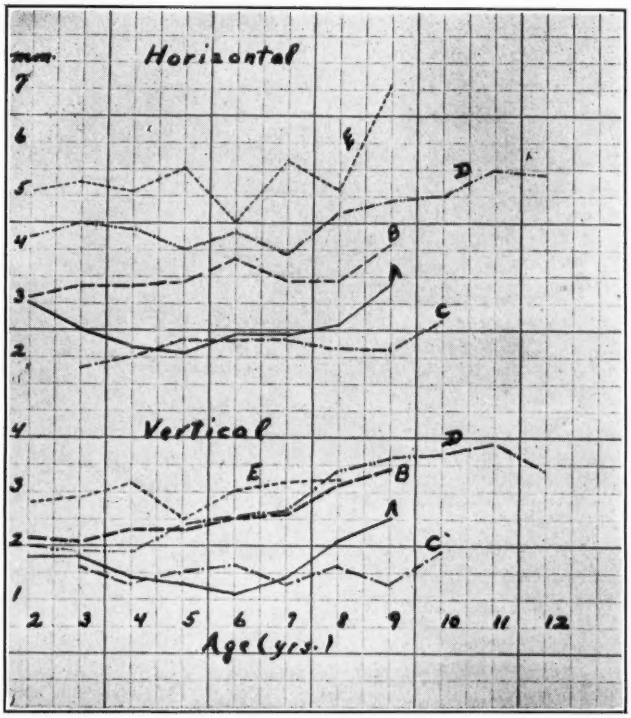


Fig. 4.—Horizontal and vertical overbite between 2 and 12 years. (Normal occlusion: A, good overbite; B, faulty overbite. Abnormal occlusion; C, overbite unaffected; D, excessive overbite; E, Angle's Class II.)

INCREMENT OR DECREMENT BETWEEN 3 AND 9 YEARS INCLUSIVE

	HORIZONTAL					VERTICAL				
	A	B	C	D	E	A	B	C	D	E
mm.	0.9	0.8	0.4	0.4	1.8	0.7	1.3	−0.3	1.7	1.0
Percentage	36	24	22	9	34	39	62	−19	89	34

Horizontal overbite in normal occlusion, both A and B, has obviously increased appreciably, especially relative to the initial dimensions at 3 years. A considerable amount of increment, absolutely greater than in any other group and relatively virtually as much as in any, is also evident in the horizontal protrusion of E or Class II malocclusion. Rather surprisingly, the increase of horizontal overbite in D is slight either absolutely or relatively.

Regarding vertical overbite, most noteworthy are the marked absolute and relative increments in B and D, especially in the latter. Also of interest is the actual diminution in vertical overbite in C at 9 years as compared with the amount of overlapping at 3 years. The factor of deciduous and permanent teeth, however, must be kept in mind in the interpretation of vertical overbite as related to age.

Some notion of the quantitative variability in horizontal and vertical overbite may be obtained from a perusal of the ranges in Table V. The minima and maxima, representing the ranges, are classified according to the presence of (maxillary and mandibular) deciduous or (maxillary and mandibular) permanent central incisors respectively.

TABLE VI

DISTRIBUTION OF HORIZONTAL OVERBITE IN NORMAL AND ABNORMAL OCCLUSION

	TOTAL NUMBER OF CASES	PERCENTAGE				
		SLIGHT (0.0-1.5)*	MODERATE (1.6-3.5)	EXCESSIVE (3.6-5.9)	MARKED (6.0-9.9)	EXTREME (10.0)
Normal						
Deciduous	242	7.4	74.4	18.2	–	–
Lower permanent	30	10.0	66.7	23.3	–	–
Permanent (6-7 yr.)	28	7.2	53.6	39.2	–	–
Permanent (8-11 yr.)	36	–	63.9	36.1	–	–
Abnormal						
Deciduous	161	3.1	30.4	53.4	12.4	0.6
Lower permanent	35	2.9	34.3	51.4	11.4	–
Permanent (6-7 yr.)	79	1.3	44.3	43.0	8.9	2.5
Permanent (8-12 yr.)	161	1.9	26.7	49.1	20.5	1.9

*Figures in parentheses are the metric ranges for the several descriptive divisions.

TABLE VII

DISTRIBUTION OF VERTICAL OVERBITE IN NORMAL AND ABNORMAL OCCLUSION

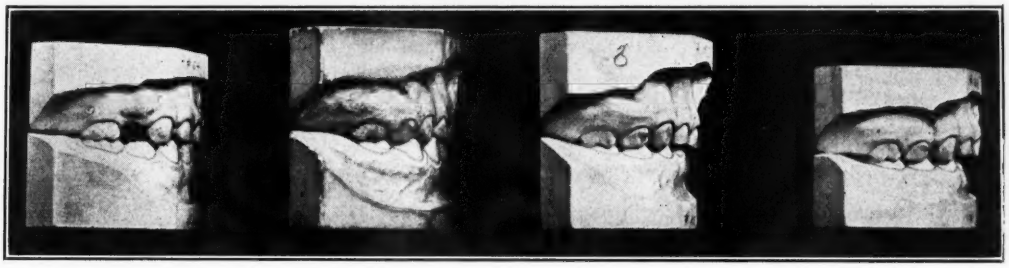
	NORMAL PER CENT				ABNORMAL PER CENT				
	TOTAL NUMBER	SLIGHT	MODERATE	EXCESSIVE	TOTAL NUMBER	SLIGHT	MODERATE	EXCESSIVE	MARKED
Deciduous	238	12.6	73.9	13.4	157	17.2	47.1	31.8	3.8
Lower permanent	28	35.7	53.6	10.7	32	28.1	34.3	28.1	9.4
Permanent (6-7 yr.)	27	40.7	40.7	18.5	76	38.2	38.2	23.7	–
Permanent (8-12 yr.)	36	13.9	52.8	33.3	159	21.4	35.2	39.0	4.4

Note.—The limits for the above subdivisions are: deciduous and lower permanent, slight 0.0 – 0.9 ; moderate 1.0 – 2.7 ; excessive 2.8 + . Permanent teeth, slight 0.0 – 1.9 ; moderate 2.0 – 3.5 ; excessive 3.6 – 5.5 ; marked 5.6 + .

The range of horizontal protrusion and vertical overlapping, respectively, is considerable in all the divisions of occlusion, excepting, of course, the F and G categories (open-bite and mandibular incisor protrusion) in which, indeed, the ranges are also marked. However, as might be expected, the minima and maxima, especially the latter of Class II (E) and the "excessive" group in Class I (D), are much higher than those in the other groups, especially in "good bite" of normal occlusion. Class II exhibits the most extreme horizontal overbite, as well as, indeed, the greatest absolute range in the horizontal protrusion.

With regard to deciduous and permanent dentitions, the maxima tend to be higher in the latter in both horizontal and vertical overbite. This tendency in vertical overbite is probably due, as has been previously intimated, to the larger permanent teeth. Perhaps of greater import, however, is the indication of appreciable overlapping among the ranges, between subdivision and subdivision, and in both normal and abnormal occlusion.

It was also considered conceivable and not unlikely that differences in extent of horizontal, and especially of vertical, overbite occurred when the man-

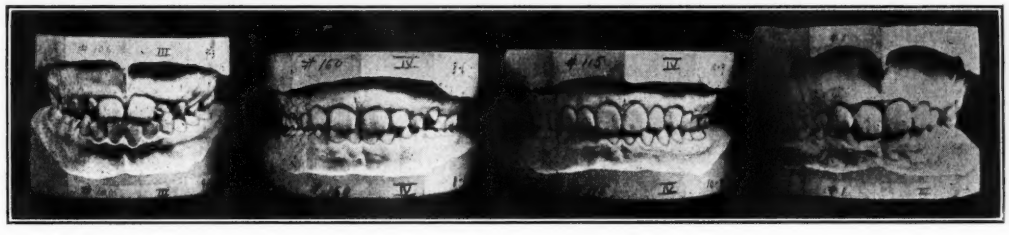


A (0.3 mm.) B (1.5 mm.) C (3.5 mm.) D (5.9 mm.)

Horizontal Overbite

A (0.0 mm.) B (0.9 mm.) C (2.7 mm.) D (5.5 mm.)

Vertical Overbite (Deciduous Incisors)



A (0.0 mm.) B (1.9 mm.) C (3.5 mm.) D (6.6 mm.)

Vertical Overbite (Permanent Incisors)

Fig. 5.—Horizontal overbite: *A*, minimum; *B*, upper limit of "slight"; *C*, upper limit of "moderate"; *D*, upper limit of "excessive"; maximum (11.9 mm.) is shown in model in Fig. 2.

Vertical overbite: Deciduous incisors: *A*, minimum; *B*, upper limit of "slight"; *C*, upper limit of "moderate"; *D*, maximum. Permanent incisors: *A*, minimum; *B*, upper limit of "slight"; *C*, upper limit of "moderate"; *D*, maximum.

dibular incisors were permanent while the maxillary incisors were still deciduous; or when at 6 and 7 years, albeit maxillary and mandibular permanent incisors were present, they were in many cases not yet fully erupted. Mention may be made that in all our cases there was one instance only in which a maxil-

lary central incisor was permanent while both mandibular central incisors were still deciduous; the permanent mandibular incisors practically always preceded the maxillary in time of eruption.

In view of these considerations, the data were analyzed according to whether (1) maxillary and mandibular central incisors were deciduous; (2) one of the incisors (maxillary or mandibular) was permanent; (3) maxillary and mandibular incisors permanent in subjects of 6 and 7 years; and (4) maxillary and mandibular incisors permanent at 8 years and after, when usually the incisors were fully erupted or very nearly so. Moreover, the conventional descriptive terms "slight," "moderate," etc., were used albeit delimited quantitatively, in order to indicate the distribution of the horizontal and vertical overbite (Tables VI and VII). Fig. 5 illustrates with actual cases the substantial agreement of the descriptive terms with the metric limits bounding these terms. It will further be noted that this method of analysis reduces to a minimum the chance of obscuring significant differences by merging of various types of occlusion, at least so far as anterior overbite is concerned, since classification is based primarily on actual amount of overbite present.

The horizontal overbite is considered in Table VI. "Moderate" protrusion of the maxillary incisors is evidently preponderant in normal occlusion, although rather appreciable percentages of "excess" protrusion are also apparent. This incidence of "excess" overbite might seem paradoxical in normal occlusion. Indeed, inasmuch as good occlusion with regard to anterior bite has generally been considered a surface-to-surface contact, should not the lack of such contact necessarily imply malocclusion? Not in our opinion. There is, it seems to us, a gradation from the very good anterior bite to a "not so good" condition, which, however, is still not so bad as to be classified in the abnormal category of occlusion; observation of any large group of dental casts will clearly show a more or less gradual merging of normal occlusion into abnormal occlusion. In any event, where moderate or "too much" protrusion of the maxillary incisors was the only fault observed in the occlusion, that case, in the present instance, was not considered abnormal. Just what is moderate, or excessive, protrusion, one must confess, is at the present time a matter of personal judgment, usually made by eye only. In fact, it would be difficult to say when moderate protrusion ended and excessive protrusion began, and it is probably this fact which is largely responsible for the presence of cases in the normal occlusion category albeit with excessive horizontal, or, for that matter, also vertical, overbite.

To return to Table VI, it is perceived that a large proportion of cases in the abnormal occlusion category also manifest only moderate horizontal overbite, a fact previously noted as well. Most of the individuals in this group, however, do possess excessive protrusion which not infrequently is extreme in extent.

Regarding type of dentition, there is apparently no appreciable difference in the distribution of horizontal protrusion between the strictly "deciduous" group and the "lower permanent" category, in either normal or abnormal occlusion; the extent of horizontal overbite does not appear much influenced by the eruption of the mandibular permanent central incisors. On the other hand, a clear tendency is discernible in the permanent dentition (maxillary and mandibular incisors) of normal occlusion for an increase in the incidence of excessive

protrusion, a trend which had also been noted in Table III. In abnormal occlusion, too, this tendency toward marked excessive overbite in the permanent dentition may be perceived.

Table VII presents the distribution of vertical overbite, wherein the various dentition categories (deciduous, lower permanent, permanent [6-7 years], and permanent 8-12 years) will obviously have special significance. For the size of the central incisors differs, of course, in the deciduous and permanent dentitions, and, besides, the factor of full or partial eruption of the incisors, generally to be reckoned with about 6 and 7 years, is obviously an important one in the determination of extent of overlapping. Indeed, cognizance was taken of the larger permanent incisors by increasing the limits for the slight, moderate, etc., categories, thus endeavoring to make the vertical overbite in the deciduous and permanent dentitions more comparable.

The greatest incidence of "slight" vertical overlap, in both normal and abnormal occlusion, occurs in the "permanent (6-7 years)" period, and significantly, the next largest proportion of "slight" vertical overbite appears in the other transitional stage, namely, "lower permanent." There can be little doubt that this condition is primarily due to the incisors usually not being fully erupted about this time. It is of interest to note, however, that a not inconsequential proportion of cases even in this "change of dentition" period manifest moderate and even excessive vertical overlapping.

A marked tendency may be noted, in both normal and abnormal occlusion, for an increase in the incidence of *excessive* vertical overbite to occur in the permanent dentition at 8 years and after. Hence, despite difference in size between deciduous and permanent teeth being "weighted," i.e., larger limits given to the slight and moderate categories in the permanent dentition, it would seem, nevertheless, that excess vertical overlapping is more common in the permanent dentition between 8 and 12 years.

D. M. Shaw, as mentioned in the first part of our paper, is quoted by Brash[2] (pp. 21-23) as having "investigated the incidence of excessive overlap of the incisors," which would apparently correspond to our excess vertical overbite. He found this condition, according to Brash, in "about 49 per cent" of 532 London school children. Excluding those who were at " 'change of dentition' ages (6 to 8)," excess overlap was present in 58 per cent of 334 "L. C. C. school children at 'stable dentition' ages." Just what ages comprise the "stable dentition" is not quite clear.

To continue the quotation, however, "the method of estimating the degree of overlap in each child was by 'eye-judgment' [and] the criterion of excessive overlap was that the upper incisors (and canines) overlapped the corresponding lower crowns vertically by one-half or more. . . ."

As mentioned before, this is, to our knowledge, the only previous attempt at measuring the vertical overbite. The present results, taken from the observations made by eye in the course of classification (Table III), indicate also a very large percentage of excess vertical overbite, namely, 42.2 per cent of 483 malocclusion cases, and 36.5 per cent of all (822) cases irrespective of type of occlusion. The discrepancy in the percentages of the two observers is probably due primarily to differences in method of classification.

The incidence of excessive vertical overbite according to metric criteria, given in Table VII, is quite similar to the eye observations.

There is a further quotation to the effect that "inferior retrusion," apparently our excessive horizontal overbite, was noted in 23.5 per cent of 85 children between 1 and 4 years. This percentage corresponds closely to our incidence of 18.2 per cent excess protrusion in the deciduous group of normal occlusion; in the combined normal and abnormal occlusion groups, deciduous dentition, there appears 37.7 per cent with excessive horizontal overbite (Table VI).

Finally, Shaw noted that "inferior retrusion" varied in degree "when expressed as the horizontal distance between the labial surfaces of the lower in-

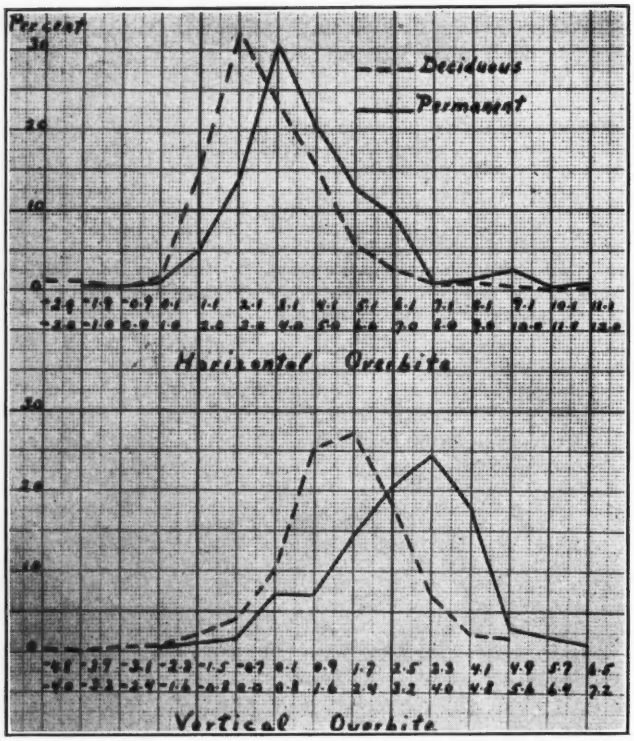


Fig. 6.—Distribution of horizontal and vertical overbite respectively, in the deciduous dentition (2-5 years) and in the permanent dentition (8-12 years), irrespective of type of occlusion.

cisors and the linguo-gingival surfaces of the upper incisors—from 1/8 inch to as much as 3/8 of an inch," or approximately between 3.1 mm. and 9.3 mm. It will be recalled that 3.6 mm. (Table VI) was taken in the present study as the lower limit of excess horizontal overbite. In view of the different landmarks used by Shaw to ascertain horizontal overbite, which would make his measurement slightly smaller than that taken in the present study, namely, between the incisal edges of the central incisors, there appears remarkably close agreement as to what constitutes excess horizontal protrusion of the maxillary incisors relative to the mandibular incisors. Allowing for the difference in method, there is also close similarity in the upper limits observed, 9.3 mm. according to Shaw, 11.9 mm. in the present data.

Now, the question of what is the general distribution of horizontal and vertical overbite irrespective of type of occlusion, in a way examined in the preceding, is further and graphically depicted in Fig. 6.

The curve representing the deciduous dentition takes in all cases between 2 and 5 years inclusive in which maxillary and mandibular central incisors were deciduous; the curve representing the permanent dentition comprises all cases between 8 and 12 years inclusive, in which mandibular and maxillary central incisors were permanent and fully erupted (or nearly so). Ages 6 and 7 were excluded because it is within approximately this interval that the transition from deciduous to permanent incisors usually occurs, in consequence of which the teeth may not be fully erupted.

It may be mentioned that negative horizontal overbite signifies protrusion of the mandibular incisors beyond the incisal margins of the corresponding maxillary teeth; and negative vertical overbite indicates open-bite of the incisors.

Considering horizontal overbite first, it is at once noted that the deciduous and permanent curves, although much alike in general form, are nevertheless clearly distinguishable. The range in the deciduous distribution is somewhat greater on the negative side, and it is plainly indicated that protrusion of the maxillary incisors is usually less in the deciduous than in the permanent dentition. Indeed, the mode, or dimension of greatest frequency, is 2.1-3.0 mm. in the deciduous dentition, and 3.1-4.0 mm. in the permanent. It is quite patent, however, that there is appreciable overlapping, many deciduous dentitions having the same horizontal overbite as the permanent.

What has been said about the distribution curves in horizontal overbite appears even more appropriate with regard to the vertical overbite. Although the fact that the permanent incisors are larger than the deciduous would seem to explain the generally greater amount of overlap evident in the permanent curve, it will be recalled that "weighting" the difference in size between deciduous and permanent incisors did not eliminate the definite tendency for vertical overbite to be comparatively greater in the permanent dentition.

SUMMARY

1. The problem was to ascertain the quantitative extent of horizontal and vertical overbite in normal and abnormal occlusion.

2. Toward this end were examined 831 plaster dental impressions of 306 children between 17 months and 12 years of age.

3. Gross classification of occlusion into normal and abnormal categories only was considered inadequate in the investigation of overbite, or, for that matter, most dental investigations where type of occlusion might affect the results. Subdivision of malocclusion into the Angle classification likewise did not seem enough, because types of occlusion varied widely, especially in the abnormal category and even in cases considered normal; and regarding the Angle classification, opposite types of malocclusion (e. g., open-bite and excess vertical overbite, mandibular retrusion and mandibular protrusion) appeared in the same class, usually in Class I, but also, to a lesser extent, in Class II. Hence, merging all types of malocclusion into an abnormal category or, as indicated, even

segregating abnormalities according to the Angle classification, might very easily neutralize and obscure significant differences latent in the material. Endeavoring to overcome, in some measure, at least, this difficulty, not only were the present data divided into normal and abnormal occlusion, and the abnormal occlusion subdivided according to Angle's classes, but the symptomatic tendencies in local parts of the occlusion (the bite) were also made criteria of classification. Moreover, knowledge of the bite in malocclusion may suggest the possible etiology of the malformation. In any event, a much more refined system of classification than now in general use is here advocated, one which would take cognizance of the wide variety of types of occlusion and correspondingly make classification more specific, clear, and meaningful.

4. In the process of working up the metric data, the incidence, each, of normal and abnormal occlusion, of Angle's classes in abnormal occlusion, and the various types of occlusion with regard to bite, was formulated with respect to age between 2 and 12 years.

5. Malocclusion appeared prevalent even at two years of age. The incidence of malocclusion dropped between 2 and 4 years, but thereafter progressively increased until at 11 years more than 75 per cent of all cases manifested some form of malocclusion.

6. The most prevalent type of malocclusion according to the Angle classification was Class I, the least prevalent, Class III. Class I diminished in relative frequency between 2 and 5 years but the incidence sharply rose at 6 years, and continued to increase thereafter. The relative frequency of Class II dropped some 50 per cent between 2 and 12 years.

7. With regard to bite, wide variability was observed even in normal occlusion, but this was especially true in the abnormal category. In normal occlusion faulty overbite increased in incidence until it was predominant in the latter years. Excess horizontal and vertical overbite were the predominant types of malocclusion in the present material. Open-bite disappeared after the seventh year. Maxillary retrusion was a negligible factor at any time.

8. It was suggested that, since malocclusion increased with age and faulty overbite in normal occlusion likewise apparently increased with time, and, as a matter of fact, excess overbite was one of the most common manifestations of malocclusion, a disturbance in the overbite in normal occlusion might therefore well be a first sign of a tendency toward definite malocclusion.

9. The incidence of the various types of malocclusion fluctuated with age, some types diminishing in frequency or even becoming eliminated (open-bite), other types relatively increasing (excess horizontal and vertical overbite).

10. Excess vertical overbite is almost always associated with excessive horizontal overbite.

11. Regarding metric extent of horizontal and vertical overbite respectively, appreciable differences occurred in the various divisions of occlusion. The amount of excess horizontal overbite in Class I was from 22 per cent to 50 per cent greater, at corresponding ages, than that in "good bite" of normal occlusion; in Class II the horizontal protrusion of the maxillary incisors was even more marked, ranging from 41 per cent to 62 per cent greater than in "good bite" of normal occlusion at corresponding ages.

12. Relatively marked increments of maxillary protrusion and vertical overlapping occurred between 3 and 9 years in both normal and abnormal occlusion.

13. Although the relative frequency of Class II in the present material diminished between 2 and 12 years, the severity of this type of malocclusion so far as horizontal and vertical overbite each is concerned, becomes greater with age in those cases remaining in this class.

14. The metric range of horizontal and vertical overbite, respectively, indicates considerable variability in all the divisions of occlusion as well as much overlapping among these divisions, i.e., cases in each of the several divisions of occlusion manifesting the same horizontal or vertical overbite.

15. The horizontal and vertical overbite, respectively, is generally greater in the permanent dentition (i.e., permanent incisors present) than in the deciduous dentition. This seems true in vertical overbite even after allowance is made for the larger permanent incisors.

Measurements of horizontal and vertical overbite were carefully taken by Miss Mary Lawlor of the Division of Child Research. Mr. A. Magilef aided with the calculations.

An excellent study upon the present subject came to our attention after our paper was in type. All that can be done at this time is to note the reference with which, indeed, on many important points our data are in remarkably close agreement. The paper referred to is "A Study of the Incidence and Manifestations of Malocclusion and Irregularity of the Teeth," by A. T. Taylor, Dent. J. Australia **7**: Nos. 10 and 12, 1935.

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ORTHODONTIC CASES RECEIVING MINIMUM TREATMENT*

GEORGE R. MOORE, D.D.S., M.S., ANN ARBOR, MICH.

"Orthodontics does not enter into the problem of social reform which now faces the people of this country." Statements such as this are constantly being made by members of our profession who in this way betray their lack of knowledge of not only (1) the true significance of social changes now in progress but also (2) the true adaptability of our field of practice to a changing social order.

We hear objections to the lack of speed with which these changes are being brought about, and many are hopeful that former conditions of social unbalance may be restored. It is the opinion of those best informed, however, that the present direction of change is not likely to be reversed. Perhaps slowly, but most certainly, we are entering upon a period of more equalized distribution of the wealth of the country, which means more equalized distribution of some of the comforts and advantages now enjoyed by the few. Increased demands are most certainly going to be made on the orthodontist. His exacting methods of the past need not become extinct, but, in order to enter into true social service, simplified and minimized treatment must become the rule. Treatment of the future must be prompted by necessity, not vanity. The object of treatment must not necessarily be perfection but rather improvement of the mouth and face only to a point where conditions enhance the individual's health and well-being.

In reporting the cases I have selected I shall call attention especially to considerations of etiology, object of treatment, and duration of treatment, the last named in no case having been unreasonably long or incommensurate with the reduced circumstances of our present social order.

CROSS-BITE ASSOCIATED WITH TIED TONGUE

The first case is that of a boy, aged eleven years, presenting a cross-bite associated with anchyloglossia (tied tongue). In Fig. 1 you will note at the top the position of the tongue coated with bismuth paste before the x-ray picture was taken without informing the boy as to reasons for so doing. The tongue here occupies a position in the floor of the mouth, but, in the lower half of the illustration, another exposure made immediately afterward shows the tongue in the palate, where the boy was asked to place it before the x-ray picture was taken. Theoretically this habitually abnormal position of the tongue may have been a factor in producing the crossed-bite by reason of the fact that teeth seldom erupt on opposite sides of the mouth at exactly the same time. Occlusion of one side might thus be interfered with to the exclusion of the other.

*Presented to the American Board of Orthodontia, and released by the Board to be read at the Thirty-Third Annual Meeting of the American Society of Orthodontists, New York, N. Y., April 30, May 1, 2, and 3, 1935.

In Fig. 2 casts in the left column show the condition before treatment; in the middle column, the condition just after treatment; and in the right column, the condition more than a year after the appliances were removed. When the middle casts were made, the patient was so pleased with the result that he prevailed upon me to discontinue treatment. He was seen again a year later at which time decided improvement was noted, especially in the maxillary right lateral incisor region which had come into occlusion, as shown in the right column.

In Fig. 3 it is possible to obtain a better view of the cross-bite on the right side, and in Fig. 2 its association with premature loss of maxillary right and

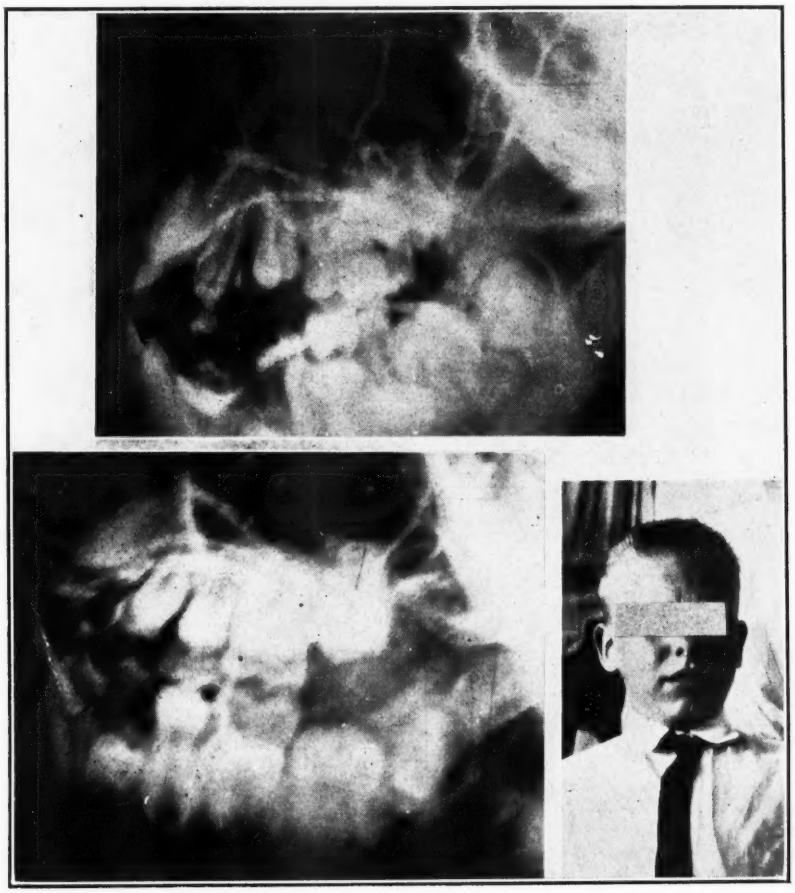

Fig. 1.

left deciduous canines and left second deciduous molar. The case might be diagnosed from these casts as a unilateral crossed-bite associated with premature loss of certain deciduous teeth, and too long retention of others. It might, by others, be diagnosed as a bilateral posteroclusion complicated by cross-bite. Diagnosing it with reference to molar relationship, it is a posteroclusion.

One of the first operations in treatment was the lancing of the frenum of the tongue, after which, for seven months, treatment was administered through the agency of a maxillary lingual expansion wire supported on the left by half round vertical tube, and on the right by means of horizontal round closed-end

tube. The buccal teeth on the maxillary right were in this way tipped buccally, which operation constituted the major portion of the treatment. The maxillary first permanent molars were later rotated by the aid of half round tubes and

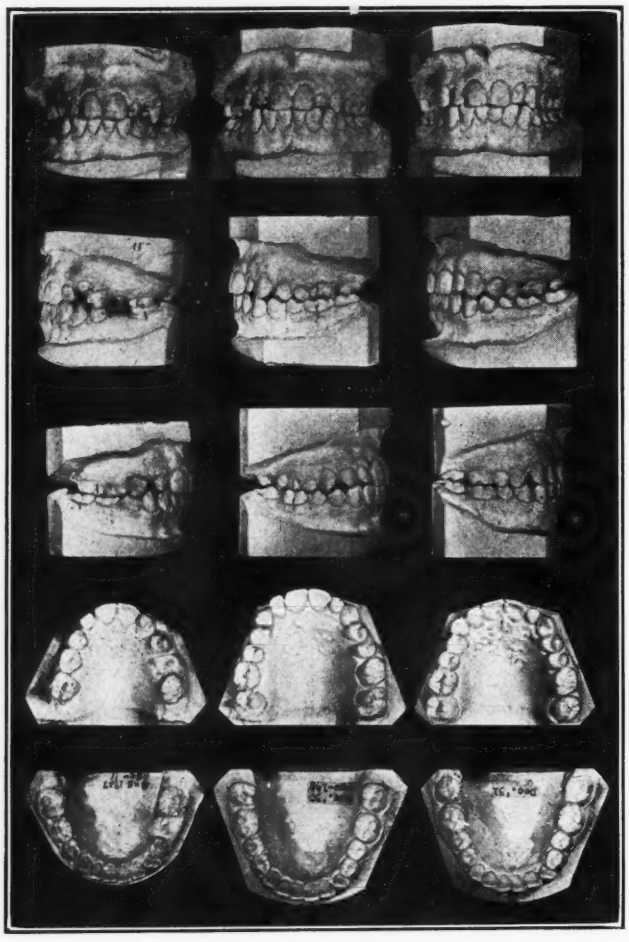

Fig. 2.

Fig. 3.

Fig. 4.

shafts, which operation was effective in correcting almost entirely the relationship of the arches. The right side of the maxillary arch drifted posteriorly during the expansion, as I have experienced in practically all cases of cross-bite

Fig. 5.

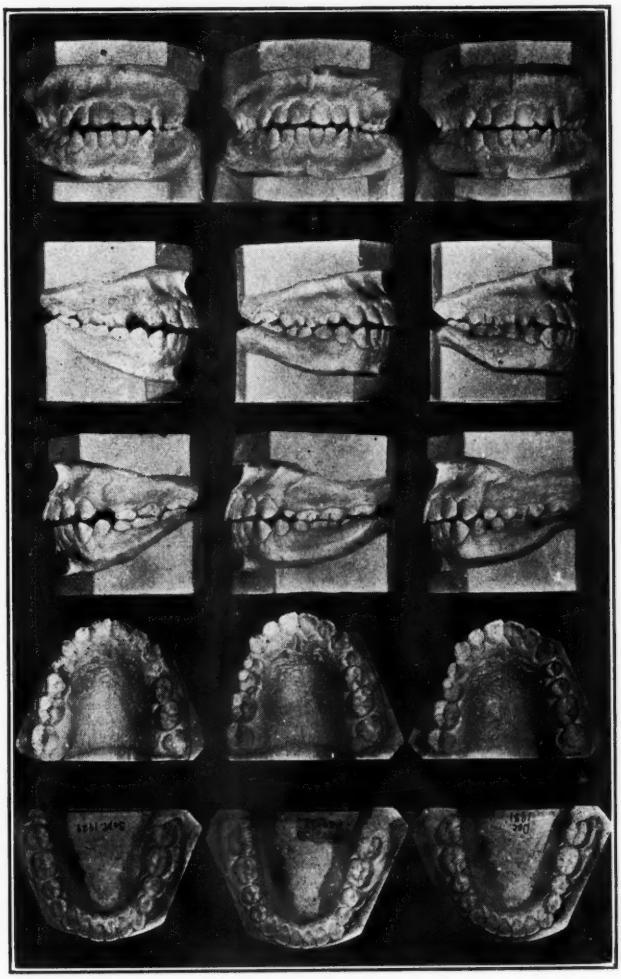

Fig. 6.

treated by this method. Auxiliary springs were used to correct the relation of the premolars anteroposteriorly. Intermaxillary elastics were used for two months to complete the shifting of arch relationship.

As to the future prospects of this case, whenever improvement continues to occur after the removal of appliances, as it did here, I look upon prognosis as favorable. The case was interesting to me because of its possible etiologic connection with anchyloglossia and because of its possible confusion with posteroclusion cases. I do not feel that it was typically a case of posteroclusion.

Fig. 4 was made a year after treatment ended.

AN OPEN-BITE ASSOCIATED WITH TONGUE HABIT

The second case is that of a boy, aged fifteen years, presenting an observation case involving a tongue-biting habit. Fig. 5 is a photograph of the boy at

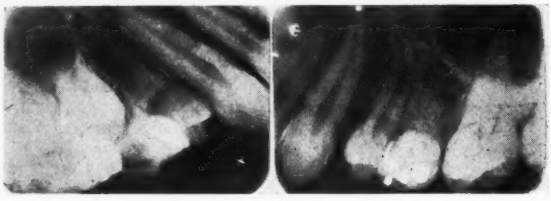

Fig. 7.

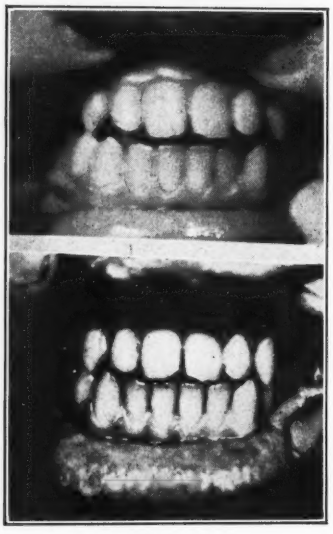

Fig. 8.

the time he presented. He had been, according to his mother, one month premature at birth, and suffered from nutritional disturbances during the first year but has been very healthy since that time, and his development has progressed normally. His height and weight, however, are decidedly above the average for his age. At the time he presented, he was a mouth-breather, and his bite was open as shown in Fig. 6 in the casts on the left. Radiographs in Fig. 7 show prolonged retention of maxillary left second deciduous molar and congenital absence of maxillary right second premolar.

When he first called for examination, it was detected that he used his tongue abnormally in speech, tongued his words, so to speak. I do not wish to infer that the etiology of this case does not include other factors. Undoubtedly

the mouth-breathing habit acted negatively by removing the effect of normal lip position, and from the facial photographs one is inclined to believe that an abnormal growth factor is present. The face admittedly exhibits a marked prognathism, but according to the mother no other member of the family known to her has ever shown such a condition.

No active treatment was administered in this case. The boy was urged to control his tongue habit voluntarily, which he did, with the results shown in the middle and right columns of Fig. 6. The bite has quite noticeably closed. The middle casts show the case fourteen months after control of the tongue habit, and casts on the right twenty-seven months thereafter.

Fig. 8 shows continued improvement after five and one-half years.

The lower rows of casts in Fig. 6 show changes in the maxillary right premolar regions. At the next appointment I shall begin to trim the proximal surface of the maxillary right second deciduous molar, whose successor is congenitally absent. This I shall do according to the technic of Dr. Lourie. The patient, though unadorned with wires, has nevertheless received the benefits of orthodontic service.

EIGHT IMPACTED DECIDUOUS MOLARS

The third case is an observational case complicated by partial impaction of all deciduous molars, fusion of mandibular left deciduous lateral incisor and canine, and congenital absence of mandibular left permanent lateral incisor. The history reveals no hereditary or nutritional etiologic factors. The child was eight years old, of a somewhat nervous temperament, still possessing at the time of her first visit the last evidences of a thumb-sucking habit, a nail-biting habit, and a lip-biting habit of some severity.

Figs. 9, 10, and 11 were taken at the time the patient first presented. Note in Fig. 10 the extreme degree of bilateral open-bite in the deciduous molar regions, and in Fig. 11 fusion of mandibular left deciduous lateral incisor and canine, and congenital absence of mandibular left permanent lateral incisor.

Unfortunately my observation of the case began after complete eruption of first permanent molars. The mother reports, perhaps correctly, that the deciduous molars had once been in occlusion. I therefore can explain the open-bite shown in Fig. 10 only very inadequately by referring to a possible circulatory or trophoneurotic disorder in that region of the developing maxilla and mandible, leading possibly to a temporary feebleness of vertical growth in the premolar region. Carrying the supposition a step farther, it is not difficult to assume such a combination of feebleness of vertical growth in the premolar regions with the normal forward and vertical growth changes of the molar regions of the preadolescent jaw as to bring about intrusion of deciduous molars. It is interesting to note that intrusion is greater in the distal than in the mesial portion of the premolar region. This is only a subjective opinion, not at all sustained by scientific evidence, and I am hoping some day to hear the real cause of intrusion in deciduous molars. As to the etiology of fusion and congenital absence above referred to, I am just as much in doubt. These conditions whose more remote etiology I do not know are in themselves the proximate factors in this case.

Figs. 12, 13, and 14 show successive stages of the observation period during which no treatment was given, except the judicious extraction of deciduous molars and close observation of spaces. It was interesting to note slight closure of the space immediately following extraction in each case, and with no treatment whatsoever to note subsequent opening of the space after the premolars had been given an opportunity to start on the path of eruption. The fluctua-

Fig. 9. Fig. 10.

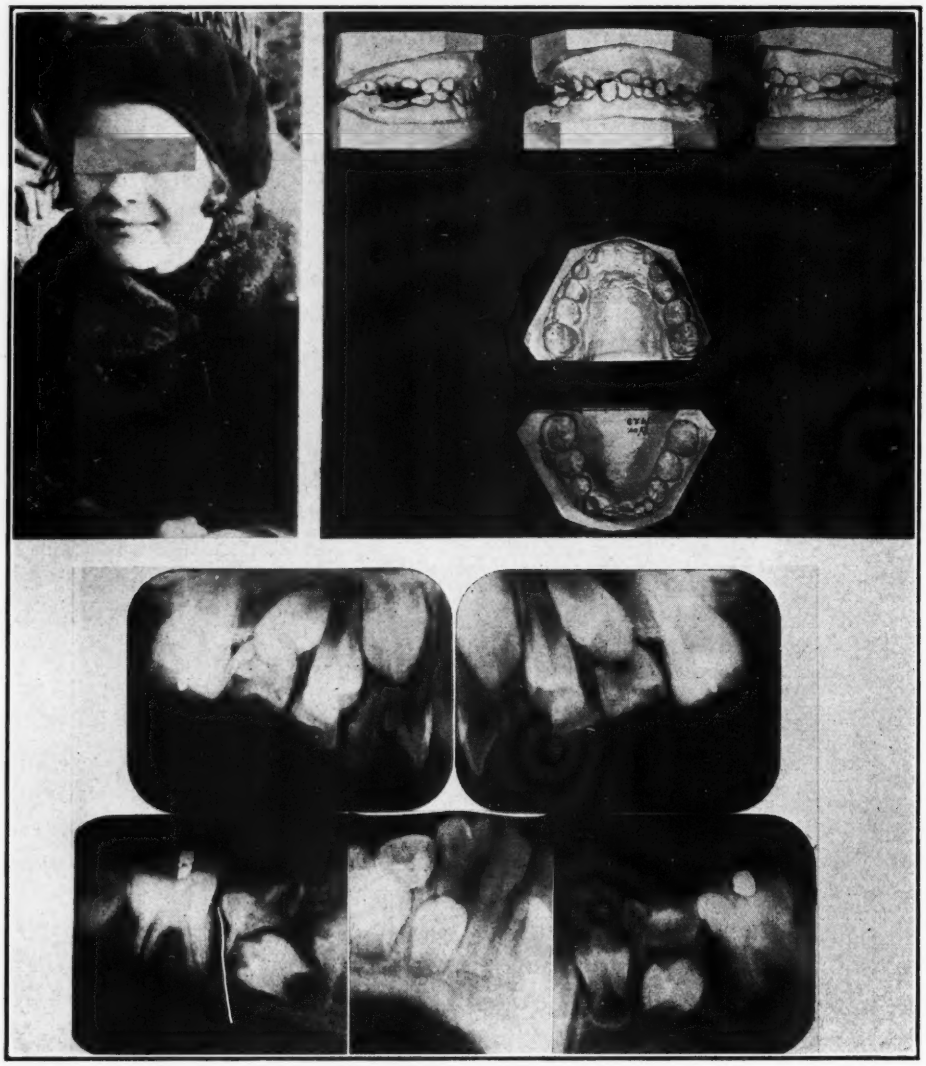

Fig. 11.

tion was in one case as much as 0.5 mm. Subsequent to the stage shown in Fig. 14, the first appliances were adjusted, consisting of mandibular lingual wire supported by half round tubes on first permanent molar bands. The permanent mandibular canines had just erupted, and it was considered advisable to apply light spring stress in the left mandibular canine region to create space for an artificial permanent lateral incisor. Active treatment continued for twelve months with the results shown in Fig. 15.

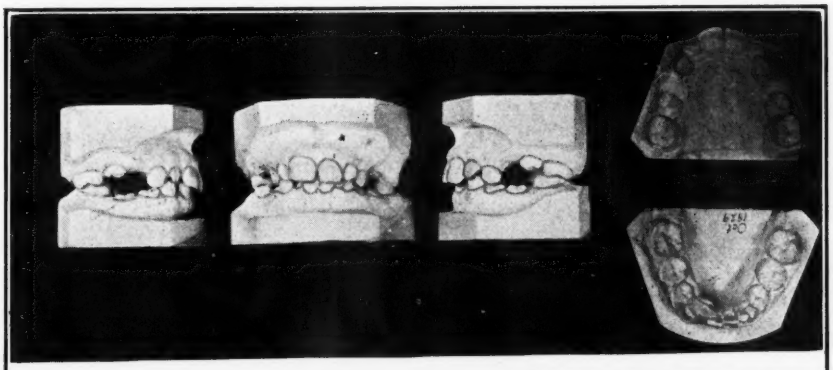

Fig. 12.

Fig. 13.

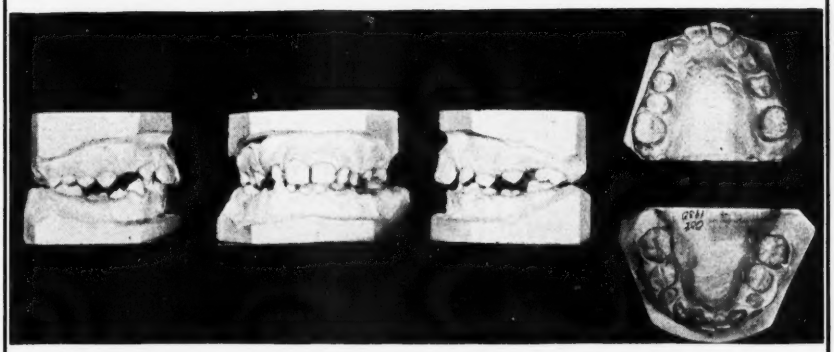

Fig. 14.

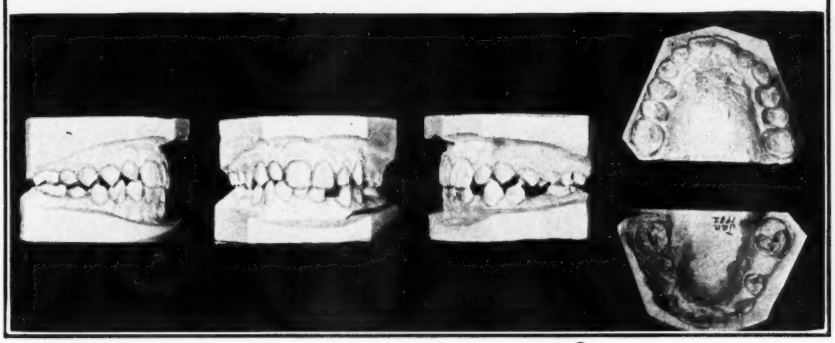

Fig. 15.

Considering the very satisfactory nature of the development of this case following removal of appliances ten months ago, there is no reason to expect relapse. The only retainer necessary consisted in mandibular lingual wire with left lateral incisor backing and facing supplying the missing tooth, as shown in Fig. 16. Were it not for the congenital absence, very little treatment and no retention would have been necessary. When I began to observe this case, I was not at all certain that the osseous structure supporting premolar regions possessed growth possibilities, but from this case I have learned to look upon cases of progressive impaction of deciduous molars in otherwise normally developing individuals as less problematic than I formerly supposed them to be.

TYPICAL OPEN-BITE TREATED BY EXTRACTION

The fourth case is that of a patient aged sixteen years, presenting a typical open-bite with obtuse mandibular angles and relatively short rami. Fig. 17 shows her extreme facial length at the time she first appeared in the office. There is possibly a hereditary etiology of the deformity. Close questioning of the mother reveals no local factors which might have contributed to the deformity.

Fig. 18 shows the degree of open-bite present when she first appeared. One is led to believe that this condition of malocclusion may be attributed to heredi-

Fig. 16.

tary factors; yet, in spite of this fact, it is interesting to note that on account of environmental factors, or perhaps other individual hereditary factors acting in one but not in another, a similar heredity has produced in several relatives quite different occlusal manifestations. The patient's father, brother, paternal uncle, and other relatives exhibit this same obtuse mandibular angle with faces very much out of proportion when the nasion-subnasion measurement is compared with the subnasion-menton measurement; and yet among the four, the patient is the only one with the bite open anteriorly. Although the father does not have a deep overbite, yet all of his teeth are in occlusion.

This patient came from a family in which dentistry is appreciated but in which it cannot be afforded. The slightest expense of treatment would have been prohibitory. First molars were already supplied with deep amalgam restorations extending almost to the horns of the pulp, and all other teeth were sound. Third molars were all present. Extraction of all four first permanent molars was therefore resorted to with the partial result shown in Fig. 19.

I believe that progress over the last two years guarantees a favorable prognosis. (Figs. 20 and 21.) Minor corrective work is advised at a later date, but I am quite certain that for financial reasons this will never be done.

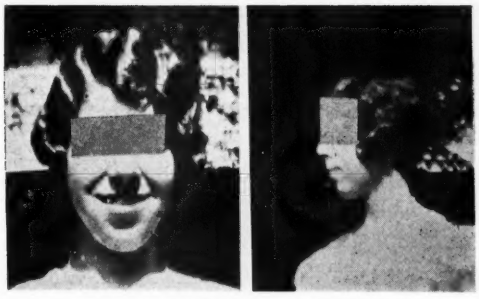

Fig. 17.

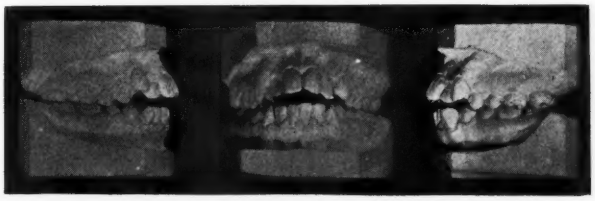

Fig. 18.

Fig. 19.

Fig. 20.

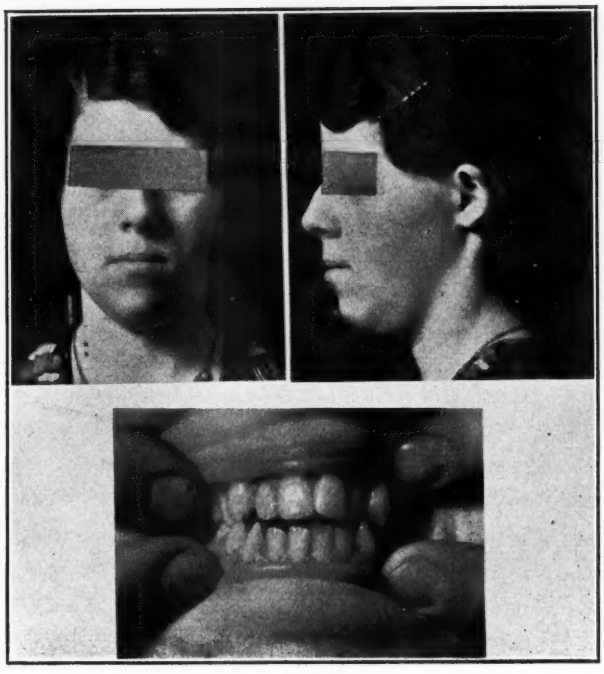

Fig. 21.

In all four cases reported, only the very minimum of treatment has been administered with the object in the child of stimulating or altering the direction of development to a point where Nature can carry it on without interference, and with the object in the adult of producing a condition from which natural forces may establish an optimum or equilibrium. Usually if natural forces fail to terminate the treatment successfully, continued orthodontic treatment would itself be wasted or even harmful. In orthodontic practice it is often more necessary to improve a dentition than to perfect it. Such improvement must be measured by physiologic or functional standards, while perfection of alignment has to do only with esthetics or engineering mechanics and is too often accomplished to satisfy the vanity of the self-indulgent orthodontist rather than to serve real necessity on the part of the patient. During the last five years in my own practice I have been confronted with an increasingly large number of patients both disinterested in and unable to pay for esthetic perfection. The orthodontist must be prepared to serve this class of patient.

Orthodontics *does* enter into the problem of social reform now facing the American people, but it will surely terminate as a specialty unless it broadens its service by simplifying its approach to the question of treatment.

GROWTH OF THE JAWS AND THE ETIOLOGY OF MALOCCLUSION

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(Continued from page 489, May)

CHAPTER X

LOCAL CAUSES OF MALOCCLUSION

In addition to the general injurious influences, the development of the jaws and the dental arches may be affected by local conditions. These conditions arise as a result of habits and injuries, and become operative through the disturbances of the physical forces which are necessarily present in the growing as well as in the adult jaws. The general causes disturb the growth processes, while the local causes disturb the physical forces which always accompany the growth processes.

Little evidence is needed to prove that such forces do exist throughout the body, although in different relative intensities in growing individuals than in adults. This is easily demonstrated in connection with the teeth and the jaws where the migration of teeth after extraction or an injury is a commonly observed condition. The persistence of the approximal contact between adjoining teeth is explainable only in terms of physical forces; and the eruption of teeth, which involves motion, cannot be conceived without the existence of an impelling force. Thus, these commonly observed phenomena cannot be explained without the assumed existence of forces, which must originate in some manner within the jaws. In order to understand properly the modes of operation of the local causes, it becomes necessary to analyze the interaction of these obscure forces, which, on account of their origin, will be referred to as intraalveolar forces.

If we pass dental floss between two adjoining teeth, we encounter resistance. In a normal fully developed adult jaw this resistance will be found to be present between all adjoining teeth. Now there are two possible explanations of this fact. The first explanation that the teeth are in passive contact, is contradicted by the often observed migration of teeth after the loss of a tooth. The second explanation that the teeth are in forceful contact is supported by the phenomenon of migration; so the resistance encountered by the passage of dental floss may be said to be due to the pressure of the teeth upon each other. This immediately directs our attention to the supporting tissue, which in this instance is the alveolar bone. It is impossible for a tooth to exert pressure on an adjoining tooth without the aid of a supporting structure, and we are compelled to assume that the force originates within the alveolar bone. The interproximal pressure may be created by the pressure of one tooth upon the other; so the other tooth offers only a passive resistance, but we may easily conceive a condition in

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which the adjoining teeth produce opposite pressures on each other. Both these explanations meet with difficulties if we extend the investigation to the interproximal spaces on either side of the one in question. If it is assumed that the adjoining teeth produce opposite pressures on each other, then in the interproximal spaces on either side a different situation must prevail. For, if at the space investigated the teeth have a tendency to press toward each other, then they must at the same time have a tendency to pull away from the interproximal spaces on either side. This indicates that the approximal contact is not maintained by the teeth producing opposite pressures on each other, because such a condition cannot exist throughout the entire denture. To assume that only one of the two teeth which are in contact is responsible for the pressure and that the other offers a passive resistance, is again not permissible. The teeth on the opposite sides of the passive tooth must press toward each other in order to maintain approximal contact, and they must, for this reason, have a tendency to draw away from the second interproximal spaces on either side of the passive tooth.

The next assumption which suggests itself is that all teeth have a tendency to press in the same direction. Considering only the canines and the posterior teeth for the present, the teeth may be assumed to press mesially. In a completed dentition the third molar would press on the second molar, which in turn would produce a pressure on the first molar. If the second molar is assumed to have the individual tendency to press mesially, then the first molar would receive pressure not only from the second molar, but also from the third molar. Thus, under this assumption, the more anteriorly a tooth is situated, the greater would be the pressure which it receives, so that the canine would have to overcome the mesial tendencies of all the posterior teeth. This is not all. We know that if a force is applied to a tooth it moves in the direction of the applied force, so that all the posterior teeth would move forward continually without restraint. It is a well-established fact, however, that the teeth in a normal denture are in equilibrium, and appreciable forward movement does not take place except due to growth.

In order to overcome theoretically the mesial tendency of the entire denture, we may make the assumption that some teeth or some group of teeth have a tendency to press mesially, while others press distally. This is the most satisfactory assumption, and seemingly it explains several conditions which may arise. It may be considered that in the transition from the deciduous to the permanent dentition the teeth do not make their appearance in the order of their position. The permanent first molars and the central incisors usually erupt at the same time, and they are followed by the lateral incisors. The next teeth to erupt are the first premolars, followed by the second premolars, and the canines may or may not precede the second permanent molars. It happens frequently that the canines erupt before the second premolars. This suggests that during transition the tendencies of the teeth present at any period are such that the integrity of the arch is preserved. Basing our further investigations on this assumption, we shall attempt to determine the direction of tendencies of the various teeth.

The tendency of a tooth to press in a certain direction is a manifestation of some activity in the alveolar bone. Brash has demonstrated that during growth

all teeth move mesially through the alveolar process. Simultaneously, they also move occlusally and buccally, or labially, but in the study of the mutual action of the teeth on each other these movements may be left out of consideration.

The mesial movement is accomplished by deposition of bone on the distal surface of the alveolus, and by resorption on the mesial surface. This is a general condition, and every tooth socket is affected similarly. From this it may be concluded that the pressures exerted by the teeth originate in the alveoli, and that they are caused by cell activity. The amount of forward movement during growth is sensibly the same for all teeth; although during the transitional period the permanent first molars move forward more rapidly to take up the space created by the difference in the mesiodistal diameters of the deciduous molars and the premolars. The apparent mesial tendencies of the teeth during

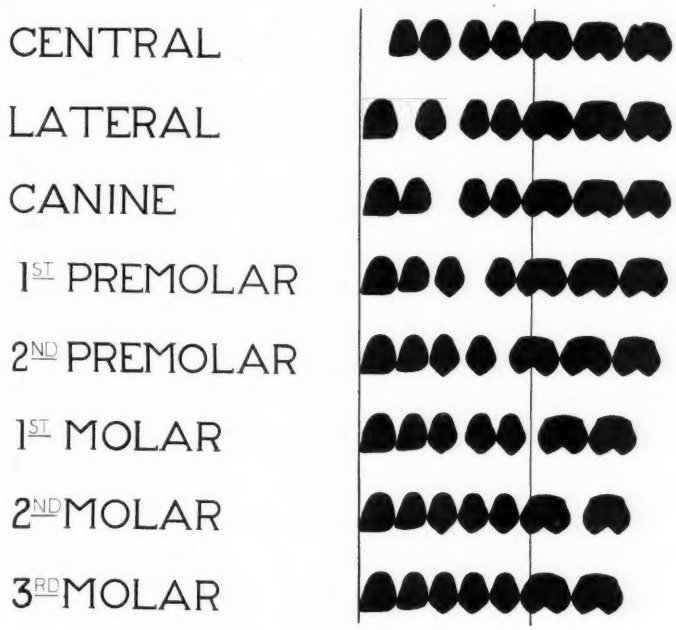

Fig. 26.—Normal tendencies.

growth do not represent their actual tendencies. The actual tendencies can be best studied by observing the changes in a complete dentition after the extraction of a tooth. (Fig. 26.) If a central incisor is extracted from a complete denture, the lateral incisor drifts mesially. Spacing may occur between the lateral incisor and the canine, but most frequently the contact is maintained, and the space appears between the canine and the first premolar.

The loss of the lateral incisor results in the distal movement of the central incisor and the mesial movement of the canine. From this it is clear that the central incisor has a distal tendency under normal conditions, while the lateral incisor has a mesial tendency.

When the canine is extracted, the central incisor and the lateral incisor move distally, and the contact between these teeth is usually maintained. The first premolar seldom migrates mesially with the creation of a space between the

premolars. If the occlusal inclined planes are not properly locked, the five posterior teeth may move forward together as a unit, without the formation of spaces between them.

The loss of the first premolar usually results in the distal movement of the canine, and in cases of long standing, spaces may occur between the central incisors or even between the central incisor and the lateral incisor. The posterior teeth move forward together without the loss of contact. This shows that the canine and, to a lesser extent, the lateral incisor have double tendencies, and that they may drift mesially or distally, depending on conditions.

The extraction of the second premolar allows the molars to move forward. The contact is usually maintained, but frequently the first permanent molar leans mesially and is thrown out of occlusion with the opposing teeth. The first premolar almost invariably drifts distally, and this tendency is so great that very often it comes in contact with the first molar, thus creating a large space between the canine and itself. The canine may also move distally.

When the first molar is extracted, the two premolars move distally together, and the space occurs between the canine and the first premolar. The second and third molars drift forward together without losing contact. Occasionally, the second molar is tilted mesially. This is a typical condition following the loss of the first molar, and from this we may draw the conclusion that the premolars have a decided distal tendency.

The loss of the second molar is never accompanied by a distal movement of the first molar, and all contacts anterior to the extracted tooth are maintained. The third molar may move into contact with the first molar, but most frequently it is tilted forward. The loss of the third molar is never followed by a migration of the remaining teeth. From this it appears that all molar teeth have a mesial tendency. The premolars display distal tendencies, and they move mesially only under the influence of the pressure exerted by the molars from behind. If we examine the diagram depicting these tendencies (Fig. 27), we shall observe that at several interproximal points there is a reversal of tendencies of the adjoining teeth. At the median point the central incisors tend to move out of contact. The lateral and central contact point shows another reversal of tendencies, but in this instance the two teeth press against one another. A similar condition exists between the first molar and the second premolar. These observations taken together with the order of eruption have an important meaning in connection with the development of malocclusion.

In the malrelation of the teeth, in addition to abnormal jaw development, conditions arise which are caused directly by a disturbance of the intraalveolar forces. The reversal of tendencies may be responsible for the formation of spaces between some teeth, and this usually happens where the tendencies of the teeth are in a direction away from the points of contact. While spaces may occur between any or all teeth, the most frequent locations are between the central incisors and on either side of the canine, but usually between the canine and the first premolar. And again, in places in which there is a reversal of tendencies toward the contact point, we find the most frequent impactions of the teeth. For this reason the lateral incisor, the canine, and the second premolar are found to be impacted or forced out of alignment more often than any other

teeth. Thus, the formation of spaces and the impaction of teeth should not be looked upon as factors causing malocclusions, but rather as a result of some influences which may be responsible for the more general disturbances associated with these conditions.

An exact knowledge of the normal tendencies of the teeth enables us to trace the effect of local disturbances on occlusion, but in addition such knowledge aids materially in the design of appliances and in the proper decision regarding the method of treatment. Since the tendencies of teeth manifest themselves by motion in the direction of the tendencies, in practice every tooth should be looked upon as having tendencies in three directions. Tooth movements in the direction of the tendencies are easily performed, but a great deal of difficulty is experienced when a tooth must be moved opposite to its normal tendency. Thus, it is extremely easy to move a molar mesially, but its distal movement is one of the

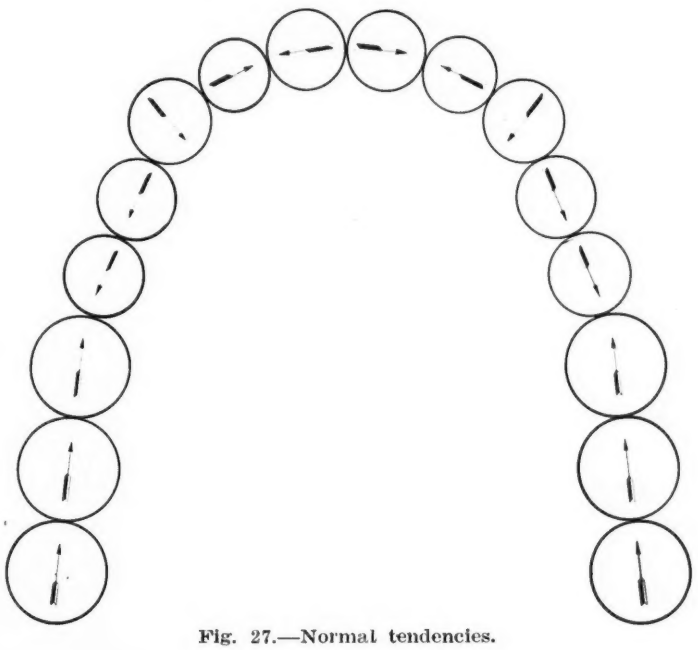

Fig. 27.—Normal tendencies.

most difficult movements we are called upon to perform. This also forms the basis of the study of anchorage, and in certain tooth movements a careful analysis of the conditions must be made.

In the study of the local causes of malocclusions, certain mechanical factors must be taken into consideration. During mastication the mandibular teeth are brought into repeated forceful opposition with the maxillary teeth, and through the occlusal inclined planes the opposing teeth mutually affect each other. The plastic nature of the supporting tissue permits individual adjustments of positions, so that under the influence of the force of mastication the teeth are forced into the most advantageous position with respect to each other. This is true of teeth in normal occlusion, but it is also true of teeth in malocclusion, and in every instance the force of mastication and the relation between the occlusal inclined planes determine the individual positions of the teeth, and often the relationship of the jaws.

It is not proper to speak of the force of the inclined planes, for the inclined planes only transmit and direct the forces of mastication to the teeth. Inasmuch as the forces of mastication and all other forces of function, such as those due to speech, deglutition, etc., are caused primarily by muscular action, the mechanical factors are all included under the heading of *muscular activity*. The usual division of the forces of occlusion into (1) muscular pressure, (2) force of the inclined plane, and (3) atmospheric pressure, is only a specific division of the diverse muscular efforts. The three other forces of occlusion conventionally given, namely, (4) normal cell metabolism, (5) normal approximal contact, and (6) harmony in the size of the arches, are better accounted for by the intraalveolar forces, which on account of normal cell activity are responsible for this group of so-called forces of occlusion. Thus, the forces which may come upon a normal denture are either internal or external in origin. The internal forces originate in the alveolar bone and are manifested in the individual tendencies of the teeth. The external forces are all the result of muscular action and, regardless of how they may be described, represent the influence of that part of the entire mechanism which is responsible for the production of motion and force.

A malocclusion may develop if the internal or external forces on the denture are disturbed, and it often happens that both the internal stresses and the external forces are influenced. These disturbances may become operative on a case of normal occlusion, but they similarly affect cases of malocclusion. They have no connection with the inherited causes of malocclusion or with the feebleness of growth, except that in the last instance the results which follow the local causes will always be in accordance with the pressure-growth curves of Jansen. For broader generalization the local causes should be looked upon as entirely independent of the inherited and the general acquired causes.

The local causes of malocclusions may be divided into three groups:

1. Injuries.
2. Developmental defects.
3. Habits.

These groups will be taken up separately, and an explanation will be given of their mode of operation.

Injuries of the dental and masticatory apparatus may have a definite influence toward the establishment of certain types of malocclusions. Under this heading we may consider: (a) early loss of teeth, which includes the early loss of deciduous teeth, and the loss of permanent teeth; (b) loss of the mesiodistal diameters of teeth due to caries and fractures; (c) impaired muscular action; (d) fractures of the mandible and maxilla.

The loss of teeth under certain conditions may bring about malocclusions. In this connection we must consider the deciduous, permanent, and mixed dentitions. During development the dentition passes through these stages, but the final effects are always interpreted in relation to the permanent set. The loss of a tooth may or may not affect the permanent dentition. The deciduous teeth

are lost normally at successive periods, and they are shed at the time when the permanent successors are ready to erupt. The intraalveolar forces at such times are properly balanced, so that while movements due to growth and eruption may take place, excessive migration of the teeth may not occur. If, however, a tooth is lost earlier than its predetermined physiologic period, the teeth will migrate in the direction of their tendencies, or in the direction of the resultant of the tendencies of those teeth which happen to be affected. The early loss of a tooth is classed as an injury, and this applies equally to the loss of the deciduous and permanent teeth. A deciduous tooth is lost early if the loss occurs before its normal time of shedding. The loss of the permanent teeth is always too early, for they are meant to serve throughout life.

The probable effect of the early loss of a tooth may be easily estimated from the knowledge of the normal tendencies of teeth and the time at which the loss occurs. In general, the earlier in life the injury occurs, the greater will be the disturbance. Thus, the very early loss of the second deciduous molar may result in a marked forward drift of the permanent molars or in the impaction or malalignment of the second premolar. The loss of the second premolar, which follows the second deciduous molar, cannot have such a marked effect, for even before the second premolar erupts, the permanent molars are already in position and are properly locked. While it is possible for the molars to drift forward under this condition, this tendency is partially counteracted by the forces of mastication transmitted to the drifting teeth by the occlusal inclined planes.

The loss of the first deciduous molar is seldom followed by the impaction or malalignment of the first premolar. This is due to the fact that the first premolar is the first posterior tooth to erupt after the permanent first molar, and the shedding of the deciduous tooth occurs early in life. In order to have a marked effect on the permanent dentition, the deciduous first molar would have to be lost very early; otherwise the permanent tooth which follows it will exert its influence to prevent the migration of teeth.

The early loss of the deciduous canine should be carefully guarded against. Since the permanent canine is usually the last tooth to erupt in front of the permanent first molar, the early loss of the deciduous tooth allows a longer period during which migration of the other teeth may take place. This results in frequent impactions and malalignment of the permanent canines.

The deciduous incisors are the first ones to be shed, and for this reason the effect of an early loss is seldom followed by severe disturbances. The crowding of the permanent anterior teeth is more often due to lack of lateral development.

From this it appears that the early losses of the deciduous second molars and the deciduous canines are most likely to bring about malocclusions. Since usually the teeth migrate in the direction of their normal tendencies, the corrective procedures involve tooth movements directly opposite to the direction of migration. These movements are most difficult to perform, and in severe cases often impossible. For this reason all deciduous teeth should be kept under careful observation, and every effort must be made to retain them until their normal time of shedding.

On account of the great forward tendency of the permanent first molars, the commonest result of the early loss of teeth is the forward drift of the posterior teeth; and, wherever this condition occurs, the causative factor is well established.

The effect of the loss of the mesiodistal diameters of teeth, due to caries or fractures, is similar to that of the early loss of teeth; the effects differ only in degree.

Impaired muscular action may be due to direct injury of the muscles of mastication or to diseases of the motor nerves which supply those muscles. While all conditions influencing muscular activity cannot be classed as injuries, the final effect is the same on the development of the jaws, and for this reason they will be discussed under the same heading.

Impaired muscular activity may have a retarding influence on bone growth. If a muscle or a group of muscles is not sufficiently active, according to the pressure-growth curves of Jansen for normal individuals, certain changes in the rates of growth take place. Due to the impaired muscular function, the pressure on the growing bone is diminished, and this brings about a retardation of the growth processes, so that the bony part in question cannot develop to its normal limits. The pressure-growth curves indicate that up to and slightly beyond the normal pressure, growth increases in direct relationship with pressure, but at greater pressures the relationship becomes inverse, or, in other words, a further increase in pressure is accompanied by a decrease in the rate of growth. This, however, does not explain the physiologic mechanism which controls the above relationship.

To understand better the response to functional pressure during growth, it may be considered that muscle, as well as bone, is supplied by nerves. In muscle these nerves are primarily motor nerves, but in addition there are sensory and trophic nerves distributed throughout. The trophic nerves have something to do with the nutrition of the parts they supply, and apparently they are stimulated by functional stresses which develop within the respective parts. This increased stimulation of the trophic nerves brings about an increased development as a result of more active nutrition, so that within certain limits an increase in functional activity is accompanied by an increase in growth and development.

Thus the motor nerves activate the muscles, which on account of their contraction bring about a stimulation of the trophic nerves within themselves and within the bones to which they are attached. This results in increased development of both the muscles and the bone. The stimulus due to muscular activity is spoken of as the *trophic stimulus.*

It often happens that the motor nerves supplying a muscle or a group of muscles are affected by disease or injury, and voluntary contractions of the muscles become impossible or greatly limited. The trophic stimulation is thus reduced, and development is hindered in proportion. Underdevelopments of the jaws and malocclusions of the teeth resulting from this cause are extremely difficult to correct, for in addition to the usual orthodontic procedures the muscles must be restored to normal efficiency.

In a comprehensive diagnosis it becomes necessary to know whether any of the muscles of mastication are affected. These muscles are divided into two groups: (1) the depressor group, which includes the mylohyoid, digastric, and platysma; (2) the elevator group, consisting of the masseter, temporal, internal and external pterygoids.

The depressor group of muscles exerts a lesser influence on the development of the mandible than the elevator group, because the origins of the depressors are always more loosely placed, and forceful contractions ordinarily do not occur. In the elevator group, on the other hand, powerful contractions are possible because their line of action is direct, their attachments are firm and always to bone, and when the mouth is closed, resistance is offered to their action. For this reason, from the diagnostic point of view, the elevators are more important, and their action must be studied.

The existence of impaired muscular function may easily be ascertained from the ability to perform all the usual mandibular movements when the jaws are closed. Left lateral movement is performed by the right pterygoids, and protrusive movement is brought about by the simultaneous contractions of the two pterygoids on both sides. It is clear that if a patient under examination is not able to perform, partially or completely, any or all of these movements, the muscles which are normally responsible for those movements are the ones affected.

The masseter and the temporal muscles may sometimes be involved, and since these muscles are more superficially placed, they are more frequently injured by accidents. Injury to one of the temporal muscles results in the mesial displacement of the mandible on the side of the injury, for the temporal is the only muscle in the elevator group which pulls the mandible distally during function. The masseter elevates the mandible and pulls it slightly mesially, and disease or injury to this muscle results in impaired masticating efficiency; and through the loss of trophic stimulus, the development of the body of the mandible is greatly retarded. Usually, the lower border of the mandible is deficient, with the formation of a marked semilunar notch in front of the angle of the jaw.

In general, then, whatever may be the cause of impaired muscular activity, the total or partial loss of the trophic stimulus manifests itself in retarded muscular and bony development. This presents conditions extremely difficult to correct. The malpositions of the teeth accompanying these conditions may not be very marked (except, perhaps, the narrowing of the arches), but the relationship of the jaws is never normal.

Fractures of the mandible and maxilla may be responsible for malocclusions of the teeth, which in some instances respond fairly well to orthodontic treatment, but usually the results are not satisfactory.

Developmental defects are inherited local causes, and they may be subdivided into: (a) malformed teeth, (b) fused teeth, (c) missing teeth, (d) supernumerary teeth.

The local effect of these conditions is that of the increase or decrease of tooth substance. The malocclusions resulting from developmental defects occur according to the normal tendencies of teeth, as discussed under the heading of the *loss of teeth.*

Habits play a very important part in the development of certain types of malocclusions. Usually malocclusions caused by habits are not permanent, and as soon as the habit is broken, the displaced parts return to their normal form, provided that such return is mechanically possible. These may be classified as: (a) sucking habits, (b) biting habits, (c) pressure habits.

Often, these three kinds of habits are found in combination, but whatever may be the cause, the resulting malocclusion is always of a temporary nature. The degree of malocclusion resulting from habits of any kind is different in each individual and is governed by the pressure-growth curves of Jansen. In normal individuals the resulting deformity is likely to be less than in those affected by the different degrees of feebleness of growth. Ordinarily these deformities respond readily to orthodontic treatment, with the exception of those in which the exact nature of the habit is not discovered. Here we have reference to pressure habits during sleep, such as pillowing, which usually are not observed, and pressure habits during reading or study, which persist against the will of the individual. But even in such instances the response to treatment is good after the habit is discovered and discontinued.

Enlarged tonsils and adenoids may be included in the local causes of malocclusions. Indications are, however, that these are not the direct causes of the malocclusions with which they are associated. Angle's observations confirm this belief. He observed that Class II, Division 1 cases are associated with mouth-breathing caused by enlarged tonsils and adenoids. Jansen, on the other hand, states that, in addition to muscles and bones, feebleness of growth affects the skin, the nervous system, the sexual glands, and the adenoid tissues, in the order given. This suggests that the enlarged adenoid tissues so often associated with malocclusions due to feebleness of growth (Class II, Division 1) are caused by the feebleness of growth, so that they are the results of the same injurious influences. This opens up new diagnostic possibilities, which can be advantageously employed in orthodontia.

(To be continued.)

PREVENTIVE ORTHODONTIA*

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THE task of reporting at this session of the European Orthodontological Society on the important question of prevention has been shared among many practitioners. My coreporters, being all specially qualified by their previous works to treat, some the scientific, others the clinical and therapeutic side of the question, I am very eager not to follow the same line, or I might betray my ignorance by examining the same questions with less competence and less authority. I thought that it would be more interesting if I dealt with certain often neglected aspects, the understanding of which is absolutely indispensable if one wants an efficient system of prevention obtaining as concrete results as possible. I shall therefore speak from the point of view of psychology and social economic factors.

It is undeniable that evolution occurs as much in dentomaxillary orthopedic thought as in therapeutics, an evolution whose chief importance varies more or less in proportion as the various stages succeed each other. The authors whose names figure in the first pages of the history of dentomaxillary orthopedia have, for the most part, assigned to it the strict rules of scholars, of doctrines, and almost, we might say, up to a certain point, of dogmas. This is noticeably true about Angle and Case.

The chief aim of orthodontic treatment is the restoration of a harmony, of an esthetic appearance of the dental arch, because the most diverse factors have conspired to destroy this esthetic beauty in a more or less profound manner. The extreme variety of appearances which these disharmonies present above all demands a classification to satisfy our natural desire for order and clarity. The classifications generally admitted were static, taking as a start the relation of the displaced tooth to the position which it should have occupied. This position was fixed according to rules of a conventional and relative character due to the interminable discussions which they provoked between authors.

I have no intention of reviving these discussions, and if I do recall this period of the history of our speciality, it is definitely only to bring out the following points: the orthodontist, faced with a malposition or a collection of established malpositions, used to make a diagnosis, which led him to make in some way a simple solution of the problem set by the malposition, by placing it in the correct classification. In the therapeutic world there was a precise and correct treatment to correspond to this classification; a treatment which carried out the essential work of pushing the ill-placed teeth in the direction determined on beforehand by a study of the case. Let us again make our opinion quite clear

*Read before the European Orthodontological Society at Scheveningen, Holland, May, 1934.

by saying that the orthodontist used to proceed with the straightening of teeth displaced from their normal and esthetic position. He used to act more as an artist than a doctor; his technic was mechanical, not biological.

It is from these beginnings that our speciality has evolved, so happily and so inevitably, its advance hampered only by the dogmatic character of its first teachings. I shall, I think, render the greatest homage to its pioneers by adding that the authority, the prestige of their works, and the strength of their personalities were such that the very thought of discarding the laws which they had given to orthodontics used to be considered as unbecoming and as a slight on their accomplishments. For this reason, those who were the first to follow, conscientiously or not, the influence of new ideas, ran up against scepticism, indeed often against hostility, if not even against reproach.

The only reproach which we can level at the first heads of the orthodontic schools is that sometimes they gave their ideas and their teachings a dogmatic, doctrinal character, in inevitable opposition to the evolution of ideas born of the increase of knowledge. A doctrine that is too absolute or too rigid prevents the sincerest man from adapting himself to new and progressive ideas. Suddenly he wakes up, and surprised, hustled and bewildered, he starts talking of revolution, when actually there has been only evolution.

This man is biased, so far as we are concerned, in the sphere of diagnosis; and one hesitates to report his purely objective and static classification, based on the simple registering of extractions in one or more schemes, as it is too conventional, relative and arbitrary.

Through curiosity and a sense of observation in research, diagnosis has become by degrees etiologic. It was hardly worthy of the scientific spirit, which animated them not to understand that finality, relative to the end to be attained, depends before everything on the elimination of the cause of the deformity. This truly etiologic insight has enabled us to observe the pathologic trouble, which we shall have to fight, sometimes even before its appearance. This foresight is still far from perfect; it is as yet only outlined in its main features, and already we know that the principal solutions of the problem which formerly was only submitted to us late in the child's life, not only have their roots in all the previous years of the life, but are directly allied to the problem of the constitution and to the development of the embryo.

Gradually, as etiology made its mark more clearly and more definitely in our studies, we came to see that even our pathogenetic ideas must be altered and allied as closely as possible with the teachings of biology. The latter teaches us that she has not different laws for different organs of the body: that she establishes a direct interdependence between them and that, on the other hand, the reactions are not standardized; that they are on the contrary so infinitely variable that one can consider them as individuals; which gave rise to that very true medical aphorism: "There are no diseases, only the diseased." There is no such thing as pneumonia; there are certain circumstances in the reaction to the etiologic factor of that trouble; and these certain, almost identical general symptoms could be grouped together under the name of "pneumonia." There is not even a standard treatment definitely laid down for diagnosed illnesses; there is

only a mass of therapeutic agents, which the doctor must use with careful forethought, with modification for every case, knowing well that the general principles will only help him by sketching the rough outline of the course of treatment. It is his clinical sense, that is to say, the true art of medicine, which will do the rest; and that rest is, in the majority of cases, the most important part.

Now, the problem which maxillary deformity and its consequences (dental malformations) sets, thanks to the progress of etiologic research, has found its definite and undisputed place in medical pathology. No longer is the orthodontist the mechanic for straightening teeth: he is the doctor, in the largest sense of this word, charged with the task of combating, or, better still, of preventing this pathologic trouble, which is the abnormal formation of the jaws and its consequences, the irregularity of the teeth. The whole trend of evolution leads to this change in the conception of our work and it is why our thoughts have turned more and more toward the medical side; that is why, uniting and associating ourselves with the evolution of medicine itself, we understand that with medicine our rôle will be far finer, more efficacious and more lasting than previously, because of the greater importance we shall give to prophylaxis and preventive intervention.

This somewhat historical outline was absolutely necessary before embarking on our main considerations, which are essentially psychologic; for it is necessary to know and analyze past developments, because some of those achievements are of a nature that will help us considerably. And further, this same analysis will allow us to find the real cause of certain obstacles, of great difficulties otherwise incomprehensible. This evolution in our ideas has not been universally admitted, and has not influenced the convictions of every one to the same extent. Some eager spirits adopt it at once; others are curbed by respect for tradition; others again are so held by the rigidity of doctrine that the facts do not count at all. Even personality with all its faults and virtues, plays its part, and the great truths of evolution would be responsible for aggravating opposing opinions, if occasions like these which unite us again did not allow us to state our ideas and mutually decide upon some common foundation for the progress of our science by our exchange of views. These are in fact above all, sincere and purposeful, and permit the most divergent views to serve only to bring us closer together and not in the least to offend us. For my part, all I want is to see the final consummation of the evolution of prevention, and this prevention made the chief object of your work in the course of the annual session of the Society.

But this being so, it appears to me absolutely indispensable that our convictions, strengthened by our unanimous opinion, should attract as a result of this conference great attention not only in our own profession, but in the medical world at large and among the great general public. Many errors still exist, against which we fight with very unequal chances and fortunes. We find evidence of them every day and in varying spheres. The nonspecializing members of the dental profession interest themselves only to a degree which is wholly insufficient for the problem of dentomaxillary orthopedia, especially in its preventive aspect. Every one has recently read in a well-known dental journal that all orthodontia had failed and that the experts of this speciality had agreed

to return to the old idea, namely that it was necessary to await the complete eruption of the final dentition before interfering. The fact that such a heresy can be printed marks the length of the road which must be travelled before professional psychology adapts itself to the progress of knowledge which has been confirmed by experience.

An inquiry, with the object of determining the amount of interest shown by medical practitioners in the problems of our speciality, is equally instructive. One can first draw the general conclusion that orthodontia suffers in the medical world from the fact that the tooth, and all that surrounds it, is and will yet remain for a long time a stranger to the studies and responsibilities of the doctor. It would obviously be unjust to generalize, for our ideas find a welcome, often friendly, from among some medical groups specializing in the study and treatment of the troubles of growth. Pediatricians can be and are actually becoming more and more our most useful collaborators. There are also the strongest reasons that this should be true in the case of rhinolaryngology, and in fact there is a direct collaboration frequently established between rhinologists and orthodontists which tends to result more and more in early action. But apart from this one meets far too often a somewhat paradoxical indifference or an even more surprising scepticism toward our belief in the relation between pathologic deformities of the nose and throat and definite evidence of adenoid overgrowth.

With regard to the public, it is comforting to report an evident growth of interest. Of course, one still meets many parents whose only interest is the restoration of appearance, and who cannot be brought to regard the correction of a malposition as a simple act of quick, sometimes almost insignificant, modelling. But one can generally make the patients admit the necessity for treatment; and actually only the economic crisis which makes the pecuniary sacrifices which this therapeusis demands impossible to many, is responsible for our losses. But in order to obtain from the children as much as from parents the indispensable cooperation, and to preserve it during the necessary time, one factor is essential: the authority of the practitioner. In order to gain this we think no sacrifice of time is wasted, and we have laid down a rule to place this desire for control, exclusively psychologic of course, as the preface of all therapeusis. Many failures and losses are undoubtedly due to the fact that we have neglected to assume, clearly and indisputably, this position in the mind of the parent at the very beginning.

If the development of thought has assumed in the practitioner the character which we have shown in the first part of this work, it will have had an equally marked effect on the patient and his parents. The old tendency toward esthetics effects in them a mere luxury desire. Dentomaxillary malformation and its correction become more important as we go up the social scale. This luxury treatment to which our clients appeared in the public eye to submit, was evidently incompatible with an idea of social protection, which is one tending, if anything, to democracy. In our mind it must be the most ardently hoped-for result of the advance of orthodontics that we shall abolish for all time such ideas of it as a needless luxury.

The existence of perfect morphofunctional equilibrium in the maxilla and the mandible appears to us today intimately associated with the equilibrium of general health and the preservation of the human body. It must therefore have its place in the plan of social welfare.

Left to ourselves, we run great risks of wasting our energies in useless efforts. The problem at this point leaves its consideration of the individual that it may interest itself in the majority. Individual opinions are indeed numerous and must be overcome. In different countries this end is achieved with extremely divergent results. But where these results appear momentarily more encouraging, they are still limited to the towns or to society. Nevertheless, it is true that the future of our science lies in the development of individual thought and its assimilation into protective technic and medicosocial preservation. One can measure the extent and importance of this stage by the teachings of statistical analysis. They tell us that dentomaxillary deformities play a part at least equal to that of dental caries in the chapters of infantile pathology relating to our speciality. Statistics among students show no more than 10 per cent of mouths that are morphologically correct. Despite our anxiety to attract the attention of competent public authorities, we have limited ourselves to mentioning in our official reports only clearly developed deformities in which there is an association of morphologic and functional troubles. In the course of working at the task of overcoming the opposition of the civic authorities, we have clearly shown that in the case of troubles of growth, of respiration, and of hypertrophy of the lymphoid tissues, each time observation established their coexistence with a deformity. This selection nevertheless gives us the enormous figure of 21 to 22 per cent in the most favorable cases.

It is undeniable that the authorities cannot get away from their responsibilities, after they have been shown that out of a hundred children attending the schools there are twenty whose general health, bodily and mental aptitude are imperiled by pathologic factors, which early treatment, by very simple methods based especially on functional reeducation, would put outside the danger zone.

Here enters a new element: the economic factor. So long as our therapeutics demanded the employment of delicate and costly appliances, necessitating the help of skilled technicians, the best intentions of the public authorities came up against the money question, so that such treatment was possible for only a certain number of children. Today such a fear is unfounded, for the cost of orthodontic treatment has fallen to such a point that it can no longer be advanced as an objection to the realization of a systematic plan for the wholesale protection of children against dental deformities and their consequences.

This essentially economic task, the importance and lawfulness of which cannot be ignored, would be greatly helped by the rationalization of our methods of treatment, to which rationalization our means of prevention will also gradually adapt themselves.

The chief ideas of this rationalization have already been advocated by numerous authors as well as by us. Let us recall very briefly the essential points. It is necessary first of all to establish the definite difference between prevention

and early treatment. We will, however, group them under the general headings of: prevention of maxillary deformities and malpositions in the permanent denture.

Prophylaxis, properly speaking, can be defined as prevention; and it is necessary to attach to it everything that can hinder the formation of maxillary deformity and dental malpositions.

Early treatment deals with the deformities or malpositions from the moment that they make their first appearance; its object is to arrest them, destroy them, and prevent their extension to the permanent dentition.

Orthodontics or, properly speaking, late treatment, deals with malpositions already developed and practices what one can call the regulation of teeth.

Each one of these classes into which our professional work is divided applies to three quite clearly differentiated lines of treatment. The first ought to be considered as essentially preventive, while the last is exclusively curative. The second is somewhere in between. It lies between the therapeutic and the preventive, because it attempts to correct deformity in the course of development, to hinder its increase, and consequently to prevent its definite development.

To these tendencies, on the other hand, correspond three groups of ideas, or more exactly three types of treatment, which have been very well set forth, notably by Villain and de Nevrezé.

The exclusively prophylactic stage is essentially medical in character. It is to the pediatrician, and failing him, to the family doctor that the right of exercising the necessary observation in the dentomaxillary sphere as in the other spheres of development belongs. This observation must be close enough to respond to the slightest warning with action or advice. His clinical sense must be so developed that, in whatever form this warning appears, his interest must be awakened to the same degree. More than any one else, the doctor responsible for the normal development of the child must be convinced of the absolute interdependence of all the organs, and consequently of the necessity of ensuring the harmony indispensable to this interdependence.

He must be aware of all the points which require our attention, which demand our investigation, whose importance increases as our knowledge leads us nearer and nearer the real source of the trouble.

Are these desiderata satisfactory in practice? The reply to that question depends on the kind of case and on individuals; but, in the main, the majority of that part of the medical world interested in children is far from being convinced on this point. This scepticism is in part due to the reasons which we have mentioned above, reasons which show that dentistry has very definitely the position of a poor relation in the general medical world. But it is necessary to see at the outset of this state of things the reverse side of the problem of specialization.

It very often produces the phenomenon of professional deformity, making each specialist imagine his specialty as more important than any other, or, at any rate, making him think it more important than it is in reality.

That is not a mere criticism, but a statement of fact, of a state of things of which we can ourselves be victims; it is almost a delusion.

Those, who, like ourselves, are especially keen on soliciting the attention of the rest of the medical world for the problems of dentomaxillary orthopedia, must set out on such a crusade with the faith of a saint, insensible to snubs, and calm in the face of scepticism or indifference.

Great patience and perseverance will, however, be rewarded, and they will see interest and sympathy awaken in response to their diplomacy and strategy. If it is a long and wearisome task, what matter, if only the blindness of a few is cured and some disciples are gained.

Another solution offers itself, at least to those among us who are themselves doctors, and by virtue of their diplomas have the undeniable right of interesting themselves in the pathogenic and therapeutic question; for they can interest themselves in dietetics, in rhachiotomy, in brief, act as pediatricians more than odontologists.

In theory, indeed, this solution is possible, but in practice it comes up against many obstacles, chiefly the rules of professional etiquette. The best doctor is also a man, and conflict of interests can spoil the scientific side of his work.

So it appears to us that the best solution of this problem is to be found in a scheme of medical unions, where the inconvenience of an overdeveloped specialism finds itself happily neutralized by the direct cooperation of all the members of the union. Again, it is necessary that this cooperation be complete and wholehearted, for the union would be useless if divisions persisted among members.

The European mentality, especially with regard to the public, is not yet sufficiently advanced to adapt itself to this system to the extent that we hope that it will eventually. It still finds itself torn by various conflicting emotions, notably by the fear of seeing the development of an association of interests rather than a common pooling of ideas, which would be of profit to the patient himself. We persist, however, for our part in seeing in these unions the formula of the future. Besides, they are already realized in the majority of well-organized hospitals, and we cannot see why they could not be extended to private practice.

Meanwhile, in fact, we orthodontists are generally consulted only for deformities and malformations that have already developed, that is to say, to deal with cases in the second and third category mentioned above. We have not then yet arrived (and I dare not say we ever shall) at the stage of practical application of prophylactic methods. The department of prevention would make us propagandists and advisers to the medical world. It is, however, our duty to furnish our medical colleagues with advice for use when they are called to young mothers, with children at the breast, or have to deal with very young children; to put ourselves at their service as consultants, in a word to be their collaborators. It is necessary for all this that the orthodontist should go out of his medium, that he hold a seat on the tribune of the medical societies, that he should write in the medical journals. For, if we complain, as I have above, of medical indifference, often even of the ignorance of doctors of the main features of our specialty, we must in all justice "beat our breasts and acknowledge our fault"; too often we lack the spirit essential for the popularization of our ideas and work.

I cannot make a better return to my ideas on prevention than by saying that, to my mind, our task is essentially that of adviser and consultant to the family physician and the child specialist.

The second phase, that of early treatment, is part of curative medicine and prevention. I have some hesitation in tackling it, for it may well seem that in the technical and scientific domain there is nothing material to add to the work of those who are specializing in it and of which there are many reporters at the present session.

I would wish, however, to make the most of the chance which is offered me by putting forward a final plea in favor of ideas which are dear to me, much more so as I believe that it can be done without going farther in a psychologic or social or economic direction than I have shown.

I have, in the beginning of this paper, alluded to the evolution of orthodontia in the course of the last few years, an evolution which has separated purely mechanical ideas from purely esthetic ones and has substituted for them a biologic background. On these new foundations is built a program of research, tending to adopt therapeutic methods. One of the most concrete results of this development has been obtained by an exact knowledge of the reactions provoked in the tissues by action of our appliances and also its therapeutic result; the amount of pressure used must never exceed the amount necessary for *constructive* work, for any exaggerated or brutal force merely results in *destructive* work, which is diametrically opposed to the end in view. But I have not mentioned a fact, which appears to me of capital importance, namely, that these conclusions place us in a dilemma each time we have to treat a case of dental malposition, which is in reality the consequence of some deep and sometimes very extensive osseous trouble.

This dilemma is closely allied to that elementary principle that the field of action of a force is in direct proportion to its intensity. It results, then, that a feeble force will have, in cases of great dental derangement, a field of action inferior to that of the derangement itself; while a stronger force, capable of exerting itself in the field of osseous derangements, will surpass the limit of constructive stimulation. It will provoke phenomena of osseous and radical absorption.

On the other hand, one too often forgets that biology is not only quantitative, but is also and perhaps even more qualitative. Pathologic troubles are still more clearly understood on a basis of qualitative differences, and for my part I have not yet succeeded in understanding how a force that is always identical from the qualitative point of view, to wit, the elastic force which never varies quantitatively, can respond to all the varying qualitative deficiencies reproduced in the pathologic manifestations which interest us.

The evidence of this dilemma and the necessity of fighting deformities by the means best adapted to qualitative deficiencies have occupied the attention of researchers for a long time. They have arrived at the conclusion that the cure for morphologic derangements of the facial complex is linked up with the same principles as other morphologic derangements and that there is no reason to refuse to the first the benefits of physiatric methods, which have long proved their worth in other domains.

One of the basic ideas of physiatrics lies in this principle which has all the force of a truism, that the human organism, either in actual illness or in maldisposition, gets rid of its own accord of all the active biologic factors. Thus these factors are lessened, weakened, or momentarily neutralized; and it is sufficient only to sustain them, to free them, to put the organism on the road to recovery, when the organism thus sustained and reinforced finds in itself the power of making a recovery.

This would not come in the limits to which I must confine myself, but I would have to enter into a more detailed study of these principles and of their applications in therapeutics. I must limit myself merely to mentioning them in order to make clear that they do very definitely find their application in this second category, which we have studied, so closely linked with early intervention. In regard to cases with which we are dealing at the moment, nearly all are the morphologic results of functional troubles, latent or active. Physiatrics fights them and even prevents them by methods of functional reeducation, adapted to suit each case.

These methods, however, have the immense advantage of universal applicability, and of not being at all influenced by age.

One of the principal errors associated with their use consists in believing that they are incompatible with the methods of orthodontia properly speaking, that one excludes the other. We think, on the contrary, that by a process of judicious eclecticism they can be associated, combined, and completed.

They offer, on the other hand, the greatest facilities for removing natural and economic obstacles, since there is never any question of delicate and costly apparatus, and this is therefore the most convenient plan for increasing the social influence of orthodontia.

People have raised the objection that physiatrics creates a necessity for more rigorous and continued discipline and the complete cooperation of all the interested parties. We have never understood how such a criticism can be seriously entertained. No cure can give results if it does not endeavor to develop that discipline which is essential for patient and practitioner. The latter has really only a mastery over his science if he has authority over all his patients. In this, as in all branches of medicine, prevention is still, and always will be, the best cure.

It is especially indispensable in ours because in the great majority of cases patients come to us with a false idea of their troubles, of their origin, of our ability to effect a cure, and above all we have to root out prejudice, to reform ideas. This work of psychologic straightening is more important and more urgent than the straightening of teeth. When we have realized that, when parents have given us their confidence, the rest will be child's play, and it is here in the matter of prevention that we must recognize the most important of our tasks.

TREATMENT OF A BILATERAL DISTOCLUSION WITH A LINGUOCLUSION OF THE MAXILLARY BUCCAL TEETH*

C. J. Vosmik, D.D.S., Cleveland, Ohio

HISTORY.—Boy, age nine years, weight forty-seven pounds and height forty-eight inches. The dental arches of the father were in normal relationship. The mother exhibited a distoclusion with a protrusion of the maxillary incisors. At three years of age the child was subjected to an attack of influenza, the sequelae of which were pulmonary tuberculosis and acidosis. Tonsils and adenoids were removed at six and a half years. The child was a mouth-breather. His general health had been restored to a fairly normal state at the time orthodontia treatment was begun.

Oral examination of the teeth revealed no cavities, and eruption of the teeth was taking place in a normal manner.

Radiographic examination revealed that all the unerupted permanent teeth were present.

Fig. 1 shows extraoral radiographs taken October, 1926.

Attributed Etiology.—Mouth-breathing and an early loss of the mandibular deciduous first molars may be considered the immediate cause of the malocclusion. A general derangement and retardation of growth processes by the tuberculous infection may be regarded as a remote cause.

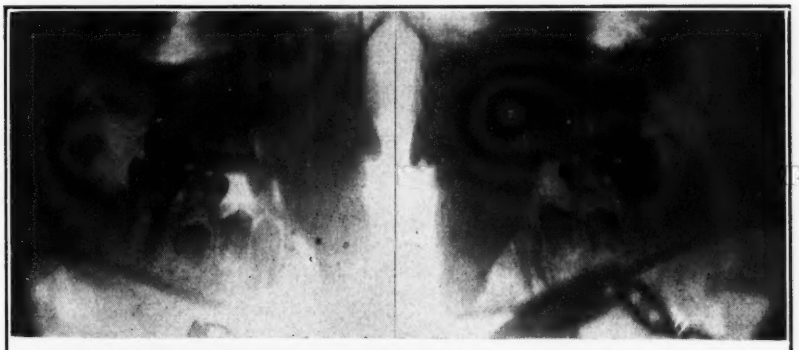
Diagnosis.—Impressions were taken and casts of the denture were constructed. The malocclusion was classified as a bilateral distoclusion with a linguoclusion of the maxillary right and left first and second deciduous and first permanent molars.

Fig. 2 shows views of casts made October, 1926.

Treatment.—The teeth and dental arches were restored to a normal functional and anatomic relationship by the following plan of treatment: first, lateral expansion of the maxillary buccal teeth; second, labial movement of the mandibular incisors and lingual movement of the maxillary incisors; and third, a change in the relationship of the maxillary and mandibular dental arches.

Molar bands carrying half round lingual tubes and 0.040 inch buccal tubes were placed on the four first permanent molars. The mandibular dental arch carried both a labial wire and a removable lingual wire. The labial wire carried 0.025 inch spring loops just anterior to the buccal tubes. The mandibular incisors were attached to the labial wire by means of wire ligatures and the loops gradually opened, thus causing the labial movement of the incisors. The lingual wire was used merely to stabilize the molars. In the maxillary dental arch treatment was begun with a labial wire, the ends of which were sprung out to exert lateral pressure on the first permanent molars. After the first permanent

*Presented to the American Board of Orthodontia, May, 1932.



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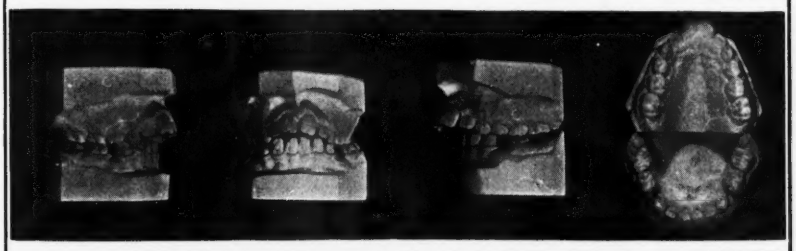

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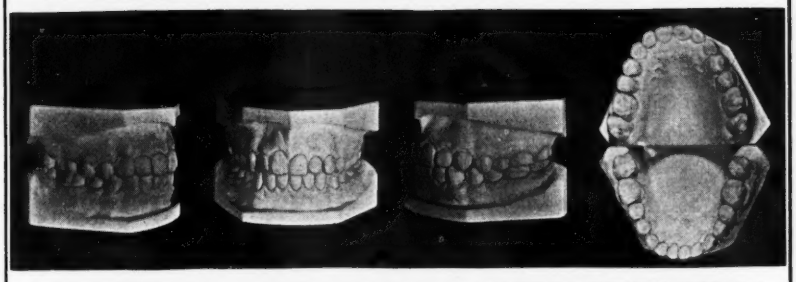

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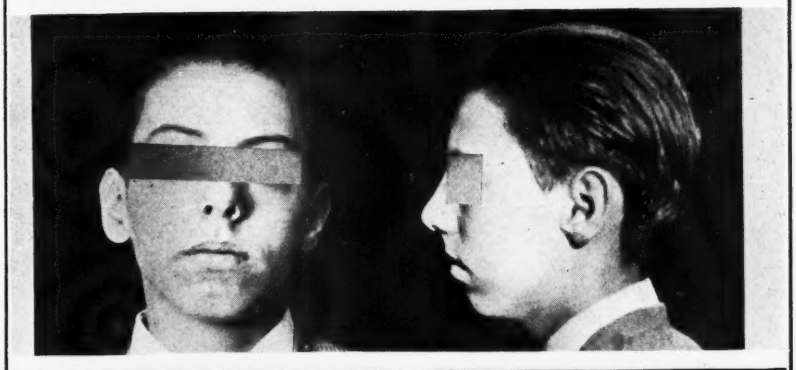

Fig. 4.

Fig. 5.

molars were placed in their proper labiolingual relationship with the mandibular teeth, the labial wire was made passive and hooks for intermaxillary elastics were attached. At this time a removable lingual wire carrying compound auxiliary springs in the region of the deciduous canines and molars was placed in the maxillary arch. The use of intermaxillary elastics was begun at this time.

Results Achieved.—The patient presented for treatment October 16, 1926. Due to the excellent cooperation of the patient in every respect the treatment progressed rapidly. In December, 1927, because a normal functional and anatomic relationship had been obtained and because the patient had apparently overcome the habit of mouth-breathing the appliances were reduced to simple lingual wires in both the maxillary and the mandibular arches. The lingual wires were the only appliances worn for the next year and a half or until May, 1929, at which time it was necessary to reinsert the mandibular labial wire to effect the rotation of both canines. All appliances were removed from the mouth in December, 1929.

Figs. 3, 4, and 5 were made in February, 1932.

Prognosis.—The prognosis is favorable that a normal functional and anatomic relationship will be maintained.

CONGENITALLY MISSING MAXILLARY LATERAL INCISORS*

JOHN A. MCPHAIL, D.D.S., CINCINNATI, OHIO

A GIRL aged eleven years presented with congenitally missing maxillary lateral incisors, an excessive overbite, and a disfiguring separation between the maxillary anterior teeth. Three views of the casts are shown in Fig. 1.

The patient was an only child, and her parents were very much concerned over the absence of these teeth. Although she was an unusually fine girl, they felt that later in life she might be very conscious of her appearance. In talking over the case with them, it was explained that the missing teeth might be supplied with bridge work or a partial denture.

Fig. 1.

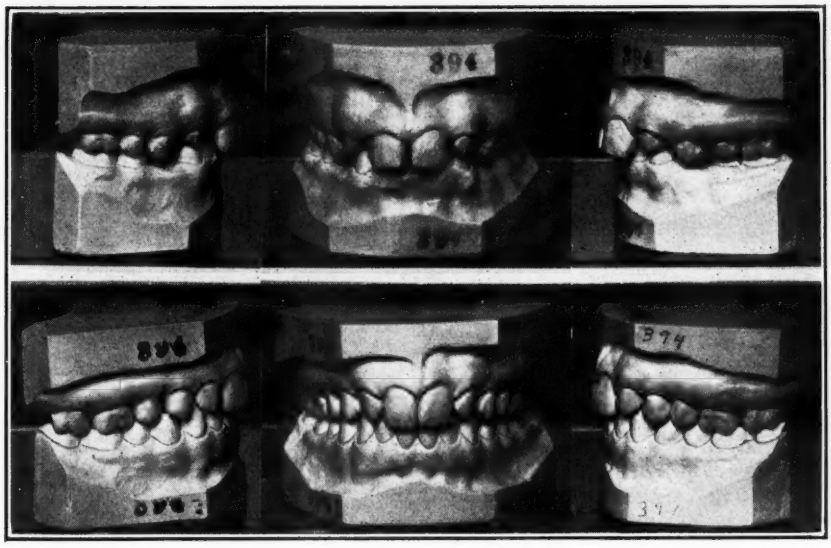

Fig. 2.

Owing to the age of the patient, it was thought best not to consider bridge work. It was further explained to the parents that an attempt could be made to move all the maxillary teeth forward in an effort to close the spaces and avoid wearing any artificial substitutes. This plan was decided on after due consideration.

Molar bands were placed on the maxillary permanent first molars, to which was soldered a lingual appliance with auxiliary springs to carry the canines forward. In the meantime, bands had been placed on the central incisors. A light wire with a ball on the end of it was soldered to the right maxillary central incisor band and passed through a tube, soldered to the left maxillary central incisor band, to permit the wire to slide through the tube. Ligatures and elastics were used for traction.

*Presented to the American Board of Orthodontia.

The spaces between the incisors and the canines having been closed, these teeth were retained and the maxillary appliance was reconstructed by adding auxiliary springs to carry the maxillary first premolars anteriorly.

A mandibular appliance was constructed with a lingual arch soldered to bands attached to the mandibular first permanent molars and the canines. Hooks were soldered to the canine bands. Intermaxillary elastics were worn from hooks on the mandibular canines to hooks that had been soldered to the buccal surfaces of the maxillary molar bands.

The maxillary first premolars were brought forward by the use of auxiliary springs soldered to the lingual wire. They were retained, and the appliance was again remodeled, and similar methods were used to carry the maxillary second premolars forward. After being brought in contact with the maxillary first premolars, these teeth were retained. Tubes were soldered to the buccal surface of the maxillary molars, and a labial arch without stops was used to keep the molars in a vertical position while they were moved forward. The arch was stabilized by ligating it to the central incisors. Intermaxillary rubbers were used.

This case was treated for five years, with rest periods during summer vacations and while she was away at college preparatory school. Fig. 2 shows casts of the case two years after appliances had been removed. The patient wore a Hawley retainer for almost a year. She gave excellent cooperation, and the final results have been satisfactory to the parents, as well as to the patient.

Department of Oral Surgery

Edited by

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CANCER OF THE PHARYNX

INCIDENCE, PATHOLOGY, AND CLINICAL FEATURES

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AS A group malignant tumors of the posterior tongue, tonsillar area, naso-, oro-, and hypopharyngeal regions are of unusual seriousness even in comparison with other malignant tumors of the oral mucosa. A rather high percentage of the patients show metastasis of the neck when they first present themselves for diagnosis. At the present time a great deal of interest is being shown concerning the care of these tumors because about one-fifth to one-sixth of them show evidence of being more radiosensitive than the average type of epidermoid carcinoma; so that before a decision as to treatment is made, it is required that one know whether or not he is dealing with one of the more radiosensitive types because in these types the results of irradiation therapy are superior to the results of surgery. On the other hand, because of these facts surgery in certain tumors not radiosensitive has tended to be depreciated and not used when it would have given the best chance to the patient.

Some authors classify what Ewing has termed the transitional cell epithelioma as ordinary squamous cell carcinoma of Groups III and IV (Broders'). It is fairly radiosensitive. The lympho-epithelioma is seen occasionally and is very radiosensitive. Slightly less common than the preceding radiosensitive types is the cellular carcinoma of schneiderian membrane origin, which is also a rather radiosensitive tumor. The adenoid cystic type of growth is rare. It is quite radiosensitive.

Incidence.—Some idea of the incidence of the various pathologic types of carcinoma of this region, including lymphosarcoma, may be gained from a perusal of Ewing's 300 cases. Lymphosarcoma although not an epithelioma is included. He classified 300 tumors in this region; his results are given in Table I.

*From the Department of Oral Surgery, Kansas City Western Dental College, Kansas City, Mo. and the Department of Surgery, University of Kansas School of Medicine, Kansas City, Kansas.

This is the fourth article of a series upon the subject of malignancy in and about the oral cavity. All phases of the subject are included.

Berven in reporting his series of malignant tumors of the tonsillar region found carcinoma 42, lympho-epithelioma 4, sarcoma (lymphosarcoma) 35, and malignant mixed tumor 5.

TABLE I

	POSTERIOR TONGUE AND TONSIL CASES 200 CASES	NASOPHARYNX CASES 100 CASES
1. Squamous	72%	30%
2. Transitional	14	37
3. Adenoid cystic	0	4
4. Lymphosarcoma	9	15
5. Lympho-epithelioma	4	11
6. Adenoma malignum	0	3

New and Childrey studied 220 cases of malignant tumors of the pharynx exclusive of the nasopharynx at the Mayo Clinic during a fourteen-year period (1917-1930); 174 or 79.2 per cent were of the squamous cell variety, that is, squamous cell carcinoma was found five times more frequently than all the other malignant tumors together. They were mostly of an active type of growth. Seventy-two of this group or 14.55 per cent were of the lymphosarcomatous type. Five fibrosarcomas were present in the group—2.27 per cent. Nine tumors (4.08 per cent) were classified as hemangioma endotheliomas, melano epithelioma, myelomas, and malignant dermoid.

Etiology.—To a certain extent the same irritative factors that tend to produce malignant degeneration in the anterior part of the buccal cavity may come into play in the pharyngeal region. Smoking and chronic inflammatory lesions in this locality probably play a rôle, but the evidence is not so clear cut as in the forward part of the mouth. The relationship of smoking to laryngeal cancer is well known and somewhat more definite.

Sex.—From 80 to 85 per cent of epithelioma in this region appears in the male sex. Eighty-seven per cent of New and Childrey's 220 cases appeared in the male sex. Of the lymphosarcomas (14.5 per cent of 220 cases) 75 per cent occurred in males. Coutard estimates that carcinoma of the tonsil, hypopharyngeal region, and larynx, occurs in the male sex in 93.3 per cent of the cases. Ledoux in a series of malignant newgrowths of this region found 54 males and 7 females.

EPITHELIOMA OF THE POSTERIOR TONGUE, NASO-, AND OROPHARYNGEAL REGIONS

The following types of epidermoid carcinoma are found in the posterior part of the tongue, the tonsillar and the pharyngeal region in general: (a) squamous cell, (b) transitional cell epithelioma, (c) lympho-epithelioma, (d) schneiderian carcinoma, and (e) adenoid cystic epithelioma.

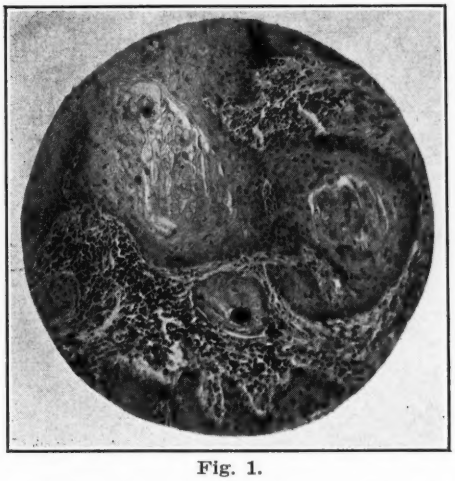
(a) SQUAMOUS CELL EPITHELIOMA:

Frequency.—Quick's large series of 2,741 cases of intraoral cancer gives one some idea of the frequency as to site of carcinoma of this region. His series showed the tonsillar region involved 318 times, the pharynx 63 times, the extrinsic larynx and epiglottis 221 times, the hard and the soft palate (together) 106

times. Fraser placed the relative incidence of carcinoma of the palatoglossal region to all intraoral carcinoma as 20 per cent with 9 per cent appearing in the lateral pharyngeal and pyriform fossa region. Duffy states that carcinoma of the tonsil accounts for 12 per cent of the intraoral cancer.

Age.—The highest age incidence of epidermoid carcinoma in this region is the same as that for carcinoma in the anterior buccal cavity with the exception that lympho-epithelioma and adenoid cystic epithelioma appear commonly in the adolescent period (from ten to twenty years of age). The commonest age for squamous cell epithelioma to be seen is the fifth decade, but the greatest incidence per number of living persons increases progressively in the sixth and seventh decades.

Pathologic Features.—Squamous cell epithelioma may be either of the primary type or of the secondary type from metaplasia. The primary type is generally more adult and as far as radiation is concerned more resistant than the secondary type, according to Ewing (Fig. 1). Many of these squamous cell



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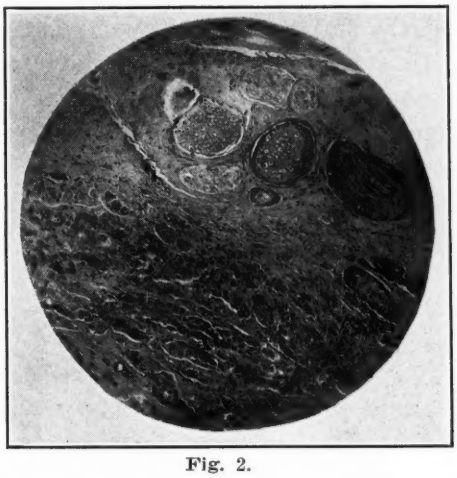

Fig. 2.

Fig. 1.—Section of squamous cell epithelioma of the pharynx showing marked piling of fairly adult squamous epithelium with basilar pegs infiltrating into fairly dense granulomatous stroma. The cells are for the most part fairly well differentiated, but definite malignant penetration is shown in some areas. Type II.

Fig. 2.—Section of squamous cell carcinoma of the anterior pillar of the tonsil. Metastasis to the kidney, spleen, and other viscera was also present. Nothing was seen in the neck glands. Note infiltration around the nerves. This section is from the primary growth.

types of tumors are rather anaplastic and very malignant. Often no keratin is produced, and only slight desmoplastic power is retained. Metastasis to the upper deep cervical lymph nodes tends to occur early, and the involved nodes are often multiple and may be bilateral. This group forms by far the largest group of tumors located in this region—about two-thirds in all. Metastasis to the bone, liver, or lungs is not common but does occur (Fig. 2). Usually the collar of lymphatics surrounding the neck acts as a fairly effective barrier.

Some men consider transitional cell epithelioma, schneiderian membrane epithelioma, and lympho-epithelioma as nothing more than anaplastic, rapidly growing, squamous cell epithelioma of Groups III and IV Broders' classification and that all the classifications pathologically are no more than just another way and a more complicated way of expressing a conception which if taken too

whole-heartedly tends to confuse the treatment. Following this latter idea to a certain extent in 174 cases of epithelioma of this region, New and Childrey found according to Broders' classification 1.72 per cent Grade I, 20.65 per cent Grade II, 41.9 per cent Grade III, and 35.6 per cent Grade IV.

Clinical Features.—Over three-fourths of epithelioma of the posterior tongue are of the squamous cell variety. Primary epithelioma of the posterior tongue, however, is very rare. Secondary invasion is not unusual. In a way, a malignant lesion on the posterior tongue assumes an intermediate picture clinically as to degree of malignancy between that of the same lesion on the anterior tongue and a similar lesion of the pillars of the fauces or the tonsil. As to the characteristics of the local ulceration, there are roughly three types of ulceration: the infiltrative, the ulcerative, and the fungiform. The description of the local lesion in the anterior tongue holds fairly well for that of the posterior tongue if one visualizes a lesion somewhat more rapid in its course. The base is hard and covered often with dirty, sloughing débris. The edges are rolled and hard. The less the invasion into deeper structures, the less malignant clinically the growth is likely to be. On the whole, the growth is fairly rapid, and in due time there appears soreness on swallowing; and this soon increases to a marked discomfort, interference with mobility of the tongue, increased salivation, fetor, and finally a definite dysphagia. As the ulceration increases, secondary infection begins to play its rôle. The lingual tonsillar sulcus often is invaded with carcinomatous infiltration which later breaks down into a crater-form ulceration. Pain then tends to radiate to the jaw and ear. The upper glands of the deep cervical chain are involved quite early but usually not so early as in tonsillar epitheliomas. Most often the glandular enlargement is on the same side, but contralateral and bilateral involvement is also common, especially if the lesion is located rather centrally.

Epidermoid carcinoma of the buccal pharynx is most commonly found on the faucial pillars or the palate rather than the tonsil or pharynx. Usually when first seen several structures are involved, as growth is fairly rapid. In about 90 per cent, more than one structure is involved when the patient is first seen. Low grade lesions tend to be hard to the touch. The more active lesions are somewhat softer and of a darker, meatier appearance.

As a rule, very little attention is paid to the early lesion of the pharynx by the patient. In one-half or more of the patients swelling of the lymph nodes is the first sign of the neoplasm noted by the patient. In the other half of the patients the first symptoms are noted within the pharynx. Some irritation, a sensation of fullness, a sensation as of a foreign body being present, a soreness or even pain may be felt. As the growth increases, the soreness in the throat increases and the mechanical symptoms of interference with function increase. Infiltration of the palatal glossal, pharyngeal or pterygoid muscles causes fixation of the jaw, difficulty in swallowing, difficulty in moving the tongue, etc. Pain appears as the ulceration increases. It may be constant or present only on swallowing, and usually it is referred to the affected side.

Sixty-seven and eight-tenths per cent of New's patients showed metastatic nodes in the neck when first seen. The nodes in the neck are rather hard and nodular in low grade epithelioma, but in high grade epitheliomas they are often

softer and more bulky. But to make this distinction accurately enough for therapeutic purposes is likely to be beyond any clinician. Seven to eight months after onset is the average duration when treatment is applied for. Although, as a rule, growth is fairly rapid, rarely an adult squamous cell epithelioma of the pharynx may be present several years before the newgrowth attains a large size.

The first symptoms of nasopharyngeal squamous cell carcinoma may be pain. Peculiar pain in an individual of carcinoma age should always warrant a thorough search for a malignant ulcer. An ulcer is probably often present for quite a time in nasopharyngeal epidermoid carcinoma without any very marked symptoms. Nasal obstruction does not occur early. Although metastasis is not so early, as a rule, as in carcinoma elsewhere in the pharynx, an enlarged hard lymph node in the deep cervical chain is likely to call attention to the true nature of the condition. On search the original ulcer is seen or felt in the nasopharynx.

The posterior palate may be involved primarily or secondarily with any of the different types of epidermoid carcinoma just described as commonly affecting the posterior tongue, tonsil, or pharyngeal regions. The great majority of the malignant lesions of the soft palate per se are moderately anaplastic and of the squamous cell type. Lesions involving the soft palate and uvula spread to the regional lymph nodes—the upper cervical chain—comparatively early, rather often bilaterally and sometimes multiply. Ledoux found that the first glands to be invaded were the two glands situated under the head of the sternomastoid muscle. Later the glands at the bifurcation of the carotid were enlarged (Fig. 2).

(b) Transitional Cell Epithelioma:

Pathologic Features.—Observers have been led to believe that because of a tendency to subsidence under intensive irradiation transitional cell epithelioma and lympho-epithelioma are essentially different from ordinary epidermoid carcinoma. Jolly and Mollier maintained that certain lymphoid structures in mucous membrane covered with stratified epithelium develop a peculiar physiologic relation to lymphocytes, a process of symbiosis of epithelium with lymphocytes, so that epithelium takes on some of the characteristics of the lymphocytes. Regaud has termed these tumors lympho-epitheliomas and probably included in this group the true lympho-epitheliomas and the tumor described in this country as transitional cell epithelioma.

Early, Quick, Cutler and Ewing used the term "transitional cell epithelioma" for a group of tumors occurring in this region because Regaud's contention of a specialized epithelium in the tumors he termed lympho-epithelioma was not regarded at that time as being fully established. At present Ewing applies the name lympho-epithelioma to slightly different types of lesion, which will be described separately.

Transitional cell carcinoma probably arises from the ducts of the mucous glands of the buccal mucosa (Ewing), although their origin is not known for certain. The lining of the buccal mucosa has not been ruled out definitely as a probable origin. The tonsil, the base of the tongue, and the nasopharynx are covered with stratified epithelium of the transitional cell type.

Microscopically, the tumor presents sheets or cords of cuboidal or spindle shaped small cells without any evidence of keratin formation (Fig. 3). Flat pavement cells are seen only in areas of metaplasia. The nuclei are relatively large and hyperchromatic. The stroma is scarce. The desmoplastic reaction is not marked. Lymphatic admixture so characteristic of lympho-epithelioma is practically absent. Distant metastasis to the liver or the bone marrow may be explained by the plentitude of blood channels which are at times seen to be lined with tumor cells. Lympho-epithelioma or a schneiderian membrane tumor may appear very similar so that the exact origin may be questionable. The metastasis ordinarily preserves the structure of the local lesion; but in some instances, if the lymphocytes of the gland are in evidence, it is not possible to distinguish the metastatic lesion of transitional cell epithelioma from lympho-epithelioma.

Clinical Features.—Martin and Pflueger state that 16 per cent of all pharyngeal growths are either lympho-epithelioma or transitional cell epithelioma.

Fig. 3.—Section of transitional cell carcinoma of the tonsil, showing solid columnar, spindle form, undifferentiated epithelial cells which have practically wiped out any remnant of tonsillar tissue.

Most commonly transitional cell epithelioma develops in the base of the tongue, the tonsil, the pharyngeal wall, the nasal mucosa and nasal sinuses. Rarely the pyriform sinus or the floor of the mouth may be a site. In the nasopharyngeal region the transitional cell or lympho-epithelioma is likely to develop in young subjects between the ages of ten and twenty years. In the nasopharynx, carcinoma of this type grows slowly, and the presence of the tumor is revealed by a nasal obstruction and bleeding or even swelling of the cervical lymph nodes. In the youthful patients tuberculosis may be suspected. In the base of the tongue or the pharynx proper the local lesion may be small and may develop slowly (several months) beneath the mucosa. Ulceration is thus sometimes relatively late, and often cervical metastasis is the first evidence of the disease as the local lesion produces only slight symptoms early in the disease. This typical, slow growing form may be difficult to recognize, but the rapidly growing form presents very definite symptoms similar to an anaplastic, rapidly growing, squamous cell carcinoma.

(c) LYMPHO-EPITHELIOMA:

Pathologic Features.—Regaud and Schmincke's observations on lympho-epitheliomas are of great interest (Figs. 4 and 5). Their reaction to radiation

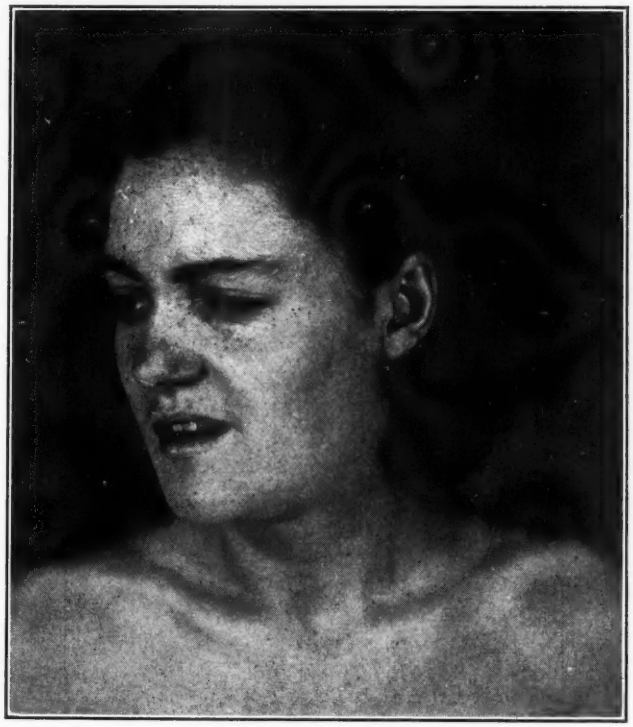

Fig. 4.—Photograph of a girl with lympho-epithelioma of pharynx. Schmincke type. Enlargement of the glands of the neck was first symptom noted. Biopsy taken. Irradiation treatment caused a disappearance of all clinical signs for the time being.

Fig. 5.—Section of lympho-epithelioma of the oral pharynx (Schmincke type). The tumor cells are seen to be widely invading lymphatic tissue and many small lymphocytes are still scattered about among the masses of hypochromatic vesicular epithelial structures.

is striking. Although the tumor is not very common, a good deal of attention has been paid to their observations. Jovin's photomicrographs show the cellular picture as containing principally large, delicate, pale staining cells sometimes

forming syncytial masses with indefinite cell borders and with large vascular nuclei, and the field is infiltrated with many lymphocytes (Figs. 6 and 7). Schmincke's sections depict cell groups with the epithelial cells more broken

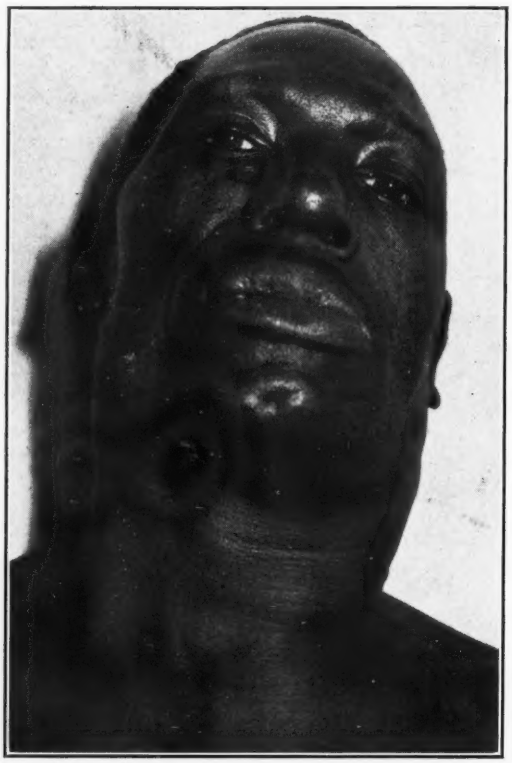

Fig. 6.—Photograph of patient with lympho-epitheliomatous mass in the pharynx and metastatic glands in the neck. Lympho-epithelioma (Regaud type). Under irradiation therapy clinical regression has occurred for the time being.

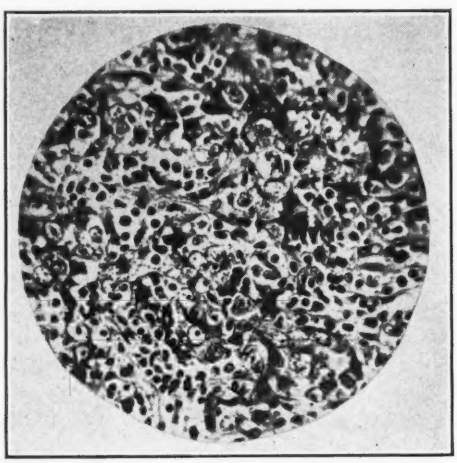

Fig. 7.—Section of Regaud type of lympho-epithelioma from the oropharynx just behind the left tonsil, showing epithelial cells to be intimately admixed with small lymphocytes and there is some accompanying reaction of the reticulae. The atypical epithelial cells vary considerably in size, shape, and staining. Section from patient shown in Fig. 6.

up so that their identification is not easy. The structures, according to Ewing, approach a lymphosarcoma. Squamous and spindle cells are not present. The lymphocytic infiltration also appears in the metastasis. The picture described

by Jovin is, according to Ewing, the more nearly correct (Figs. 8-10). It is less frequent than the picture which Ewing classifies as transitional cell epithelioma. Ewing believes that endothelioma of the lymph nodes should not be diagnosed until a local lesion is absolutely proved to be absent.

Fig. 8.—Section of lympho-epithelioma of the tonsil showing round, ovoid cells of a basophilic character. Growing from the outer walls are small blood vessels. These cells radiate about the blood vessels and are undergoing degeneration and desquamation of the outer border of the central whirl. Perithelial sarcoma of the tongue.

Fig. 9. Fig. 10.

Fig. 9.—Photograph of girl fifteen years of age on entrance to hospital with perithelial sarcoma of the tongue. Neck glands were involved. Fig. 8 shows section.

Fig. 10.—Photograph of patient two years after irradiation treatment proved the tumor to be highly radiosensitive. Clinically well after three years.

Clinical Features.—Lympho-epithelioma of the mucosa of the pharynx in general and of the posterior tongue region occurs from ten to sixty years of age and is rather likely to occur in adolescence from ten to twenty years. A rather small, soft, local tumor mass is characteristic. Ulceration supervenes rather slowly, and there is only a slight tendency to bleeding. Characteristic locations for the low, polypoid, local outgrowth are the tonsil, the base of the tongue, the recesses of the pharynx and nasal passages. The local mass is very easily overlooked, and often the cervical metastasis which occurs is the first sign to attract attention to the lesion. The average duration is said to be more than three years. The course of the disease is slow. The tumor metastasizes early to the liver and the bone marrow; and, although it is markedly radiosensitive, death usually occurs from the general metastasis. Ewing, however, reports 10 cures.

(d) Schneiderian Carcinoma:

Pathologic Features.—The nasal mucosa is lined with a stratified epithelium of small cuboidal or cylindrical cells—the schneiderian membrane. It is believed that the majority of nasal carcinomas arise from the transitional epithelium which lines the schneiderian membrane, the pharyngeal crypts and sinuses. Schneiderian carcinomas are very cellular and grow very diffiusely. The cells are small, cuboidal without pavement qualities, and sometimes glandular characteristics are seen. The epithelial quality of the cells is not definite. No infiltration of lymphocytes accompanies the growth. A few tumors of the nasal mucosa are of the adenoma malignum type, and a few are diffuse growths with large cuboidal cells. These have considerable tendency to go to bone, liver, and cervical nodes early. The typical schneiderian carcinoma suggests a special group of epidermoid carcinoma, but at present they are classified as "transitional cell epithelioma" by Ewing.

Clinical Features.—The tumors tend to be recognized early, as they obstruct the nasal fossa and bleed. They grow rapidly but peculiarly lymphatic metastasis appears rather late. As a group they are distinctly radiosensitive. The tumor is not of common occurrence.

(e) Adenoid Cystic:

Pathologic Features.—This rare, peculiarly constructed growth is most commonly found in the antrum and the nares. It most probably arises from the mucous glands of the regional mucosa. The cells resemble the basal cell type. They are small and appear in sheets. As a matter of fact, Krompecker classified these growths with the basal cell group which arises from the mucous glands of the nasopharynx. On microscopic examination numerous globules and small cysts filled with mucus are seen. A resemblance to thyroid gland tissue has been suggested. The growths are very vascular and have practically no desmoplastic properties. They metastasize relatively late but quite often to the liver, lungs, and bones. Metastasis to the neck appears relatively late. There is no great difficulty in separating these tumors from the other tumors of this region.

Clinical Features.—Clinically, these tumors grow slowly and produce a rather bulky soft mass. They occur most frequently in the nares and antrum

but also in the pharyngeal regions. Ewing described two tumors of this type in which the victims lived eleven and thirteen years respectively. Each showed recurrences several times following various operative procedures. Because of the anatomy of the nose, obstructive phenomena when the tumor appears here are rather early. In the antrum the growth may attain considerable size before symptoms appear. As a rule, metastasis to the neck is a late phenomenon. Eventually the bone marrow, the liver, and the lungs may show metastasis. Spontaneous necrosis as in sarcoma is common. The tumors are quite radiosensitive. The friable vascular structure may cause death by exsanguination, thus forcing a dramatic but easy way out for the patient.

EPIDERMOID CARCINOMA OF THE LARYNGOPHARYNX

Malignant disease of the laryngopharyngeal region is fairly common. As the patients are not submitted to an exact description of the structures involved, an exact statement of the anatomic frequency is impossible. The rate of prog-

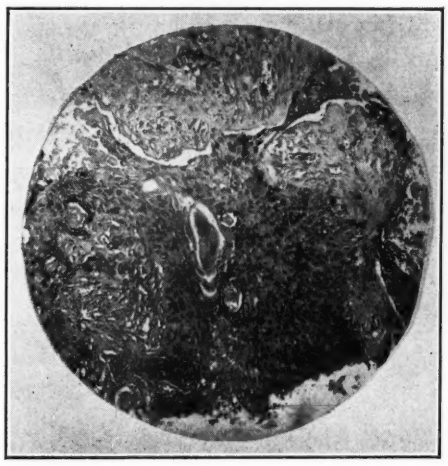

Fig. 11.—Section of squamous cell carcinoma of the pyriform sinus showing rather diffuse infiltration of the connective tissue stroma. The epithelial cells show some tendency to keratinization and differentiation (Type II—Type III).

ress is not particularly rapid, and, after the appearance of suspicious symptoms, several months usually elapse while the case still falls in the operable class (Trotter). A very remarkable characteristic is that the primary seat of the tumor is somewhat determined by the sex of the patient. Postcricoid or hypopharyngeal carcinomas are practically limited to women, while growths around the upper laryngeal opening show a very strong preference for men. Postcricoid carcinoma also appears at a relatively early age for carcinoma. It is estimated that the average age is at least ten years younger than the average age for carcinoma in general. Postpharyngeal carcinoma according to Trotter is analogous to the postcricoid carcinoma as to age and sex. Postpharyngeal carcinoma is comparatively rare. It arises from the pharyngeal wall well above the cricoid region. When speaking of extrinsic carcinoma of the larynx the following locations are considered to fall in that category: margins of the epiglottis, the edge or posterior surface of the aryepiglottic fold, the arytenoids,

and the interarytenoid fold, the posterior surface of the cricoid plate and the sinus pyriformis. The sinus pyriformis is also included because either by extension or primarily the posterior lateral outer surface of the larynx is involved.

Pathology.—Practically all carcinomas of the laryngopharyngeal region are of the squamous cell variety (Fig. 11). No special description is needed. The general description of squamous cell carcinoma under the posterior pharynx is applicable here also. A transitional cell type of tumor may be found. Most of the growths according to Broders' classification will be graded III and IV (New), but Trotter believes that a fair percentage are not of such high grade malignancy.

Clinical Features.—Malignant disease of the laryngopharynx may conveniently be divided into two groups for clinical description: (1) those of the epilaryngeal portion, and (2) those of the hypolaryngeal portion.

(a) Epilaryngeal Portion of the Laryngeal Pharynx:

These lesions arise in close proximity to the laryngeal opening. Four common points of origin are noted: (1) the epiglottis, (2) aryepiglottis, (3) the lateral pharyngeal wall, (4) the pyriform sinus. The starting point has some bearing on the treatment and prognosis. Those arising in the epiglottis, the fold, and the lateral wall lend themselves fairly well to operative care. The operative dangers are not great and the mutilation is slight. Growths of the pyriform sinus, however, are often symptomless at first, and as they soon involve the lateral wall of the larynx and the thyroid cartilage, the time when a comparatively nonexistent and a nonmutilating operation offers possibilities is often passed before the diagnosis is made.

In a male of the cancer age, it may be suspected that a malignant lesion is present in the laryngopharynx if any abnormal sensation persistently is felt in the same part of the throat. The sensation may be a tickling or a little difficulty in swallowing. Early pain usually is not present. Such symptoms are sufficient for one to do or advise a laryngoscopic examination. Three appearances are to be looked for: (1) ulcer which will be seen only in part, (2) a collection of mucopus which the patient fails to swallow, and (3) a fixed arytenoid. When little ulceration is seen, a fixed arytenoid points to a pyriform fossa lesion. The amount of fungation is not necessarily an index to the gravity of the growth (Trotter).

(b) Growths of the Hypopharynx:

These growths arise behind the cricoid cartilage in the narrow portion of the pharynx and arise from the postcricoid or postpharyngeal mucosa. Peculiarly they are almost limited to the female sex. Some difficulty in swallowing may be present for many years (Trotter). Definite obstructive dysphagia, slight regurgitation, and chronic huskiness are the signs which make the examination imperative. By laryngoscopic examination in the early stages, one does not see the growth, but in the pharynx behind the larynx there is likely to be a definite pool of mucopus which the patient fails to swallow. Later the arytenoid and the interarytenoid regions swell, turn purplish, and glisten be-

cause of edema. Late, the edge of the ulcer is seen. Fixation of the arytenoids is common. When one suspects a postcricoid malignant lesion, the direct laryngoscope should be used.

Taking both groups, epilaryngeal and hypolaryngeal, Trotter believes about half are operable when first diagnosed. He considers lesions of the lateral wall, the aryepiglottic fold, and the epiglottis as the most favorable group. These lesions are not so malignant as the other types. The anatomy of the region is favorable for excision, and the gland infection tends to be limited to one side of the neck.

Speaking in general for the region as a whole, early symptoms are local discomfort and difficulty in swallowing the salivary secretions or food. Interference with deglutination is the fundamental symptom. Later, there is also the pain of carcinomatous infiltration and secondary infection of the surrounding tissues. Thus, the early symptoms are vague, and a large gland in the neck is often the first symptom to attract attention. As the tumor increases in size and as the larynx is invaded, the voice becomes muffled. Finally, dyspnea and stridor develop. The ulceration causes foul breath, salivation, hemorrhage; and as secondary infection involves the tissues, fever may be present. As the cartilaginous box of the larynx is invaded, perichondritis and a cartilaginous necrosis are added. When the pyriform sinus is occupied by a pool of frothy mucus which reaccumulates unilaterally after a drink of water, a suspicion of cancer may be entertained. By laryngoscopic examination the pyriform sinus may be made to open out. Phonation may aid in bringing into sight a neoplasm on the edge or posterior side of the aryepiglottic fold. Similarly the upper edge of a posterior cricoid growth may be brought into view. Before this picture is seen, the arytenoids may appear congested and purplish red. In the posterior cricoid growths, suspension laryngoscopy may be necessary for a view. Ordinarily we have been able to obtain considerable information by palpation through the mouth with the patient sitting in a chair with the head thrown back. Slight cocainizing of the pharynx and a mouth gag aid one materially in the examination. It allows one to gauge the extent of the ulceration and infiltration in many instances. The posterior larynx by external palpation may be widened or there may be unilateral tenderness. Enlarged glands, of course, should be felt for. After a period of six or eight months the course of the disease is rapid, and many patients die within a year. Without treatment a patient seldom lives more than two years.

THE FINAL STAGE OF MALIGNANCY OF THE PHARYNX

In the final stage of carcinoma of the pharyngeal region, all the symptoms and signs described for the early and midperiods of the disease become more pronounced, and the surrounding tissues become more fixed according to the direction of extension. As the swallowing muscles are invaded, difficulty in swallowing is expressed. In the neck the disease progresses from one group of glands to another and from lymph node to lymph node of the cervical chain. The involved glands are at first hard and not fixed. Eventually the metastatic cells invade and rupture through the lymph node capsules, the surrounding tissues are invaded, and the gland or glands become fixed in a diffuse hard mass

of involved tissue of varying extent and site. The neck may become almost fixed by a large, hard, diffusely infiltrating mass from parotid to clavicle and from hyoid to mastoid. As the glands enlarge or the general carcinomatous mass increases in extent, central necrosis tends to appear. Eventually the skin is invaded, perforated, and a fungating ulcer appears. As structures containing nerves are involved, and the tissues surrounding the ulceration become second-

Fig. 12.—Photograph of a boy six years of age with a large lymphosarcoma of the neck which was removed surgically and irradiated. He is well at present after four years.

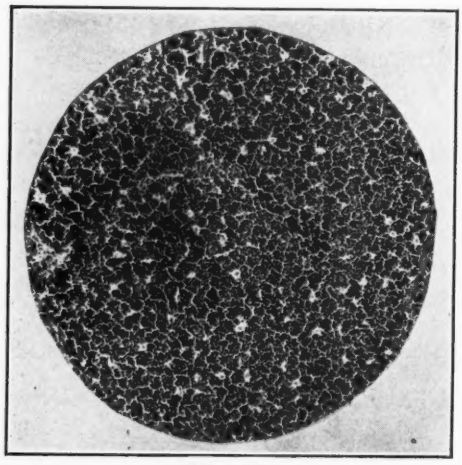

Fig. 13.

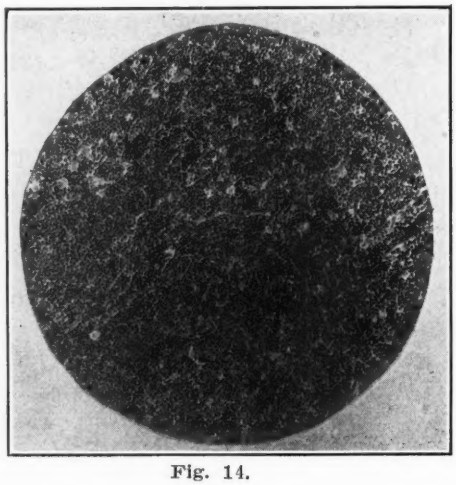

Fig. 14.

Fig. 13.—Section of lymphosarcoma. Normal gland architecture has been practically replaced by a striking proliferation or infiltration of small lymphoid cells. Occasionally scattered endothelial cells are seen. Stroma is unusually scanty. Section is from boy in Fig. 12.

Fig. 14.—Section of lymphosarcoma showing complete wiping out of the normal gland architecture by a proliferative growth of small lymphoid cells. Scattered here and there swollen proliferating cells may be seen.

arily infected, the pain increases. Besides local pain, pain may be referred up to the back of the neck and down the arm. Finally amid the stench, salivation, cancerous discharge, and pain, the patient is gradually exhausted by lack of

sleep, difficulty in eating, sepsis, and the absorption of toxins of the disease; and as death appears, it is often welcomed. If secondary hemorrhage from one of the larger arteries does not abruptly put an end to the sufferer's misery, usually a terminal pneumonia is found at postmortem examination.

LYMPHOSARCOMA OF THE PHARYNX

Lymphosarcoma, of course, is not derived from the oral epithelium, but some mention of the lesion is necessary for the sake of differentiation and diagnosis.

About 12 to 14 per cent of the tumors of the buccopharynx are lymphosarcomas (Figs. 12-14). Lymphosarcoma of the tonsil may very closely resemble a hypertrophy. The tonsil appears swollen unilaterally, often to twice its normal size, is dull red and fleshy in appearance. For some time the bulky mass appears to tend to remain encapsulated. Rarely both tonsils are involved. A leucemia or a lymphatic lymphosarcomatosis should be ruled out by the blood smear. In the pharynx, lymphosarcoma may appear as a distinct pedunculated and movable mass or as a more diffuse enlargement. The tumor is not nearly so firm as an epithelioma, and ulceration appears very much later. In fact, ulceration is usually a late symptom in lymphosarcoma. Fifty-four and nine-tenths per cent of New's cases showed metastasis in the neck when first seen. When involved with lymphosarcoma the lymph nodes are at first fairly discreet, but soon they tend to become bulky and the capsule is infiltrated. Growth on the whole is rapid. Three to four months is the average duration when first seen. In about one-fourth of them swelling of the cervical lymph nodes is the first sign of the disease.

TREATMENT

In a subsequent article after the principles of irradiation therapy are discussed, the subject of the practical care of malignancy in this region will be covered in its various phases.

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CASE OF ODONTOGENESIS IN AN OVARIAN TERATOMA

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A TUMOR, which aroused my interest, was removed from a woman, aged thirty-three years, at the Graduate Hospital of the University of Pennsylvania by Dr. B. C. Hirst, who on May 4, 1934, performed panhysterectomy and bilateral salpingo-oophorectomy. (For condensed case history see footnote.†)

The tumor was attached to the left ovary, weighed 12 kg. and measured $25 \times 15 \times 15 \pm$ cm.

Upon sectioning it was found to consist of a jumbled mass of fetal tissues derived from the three germ layers. Dr. E. A. Case, pathologist, rendered the diagnosis of polycystic teratoma (benign) thus confirming the clinical diagnosis.

On examining a number of slides of this tumor, Dr. Case found a few sections in which he recognized tooth development. It was through the courtesy of Dr. Hirst and Dr. Case that we were able to study and make photomicrographs of these sections.

A teratoma is a tumor of great complexity, which may be regarded as an abortive attempt of nature to form a body within a body without fertilization.

Teratomatous growths were first encountered in the ovaries. Wilms[1] believed they were tumors of the gonads. He thought they were derived from the ovum by parthenogenesis. Teratomas, however, are found in the head, in the thoracic and the abdominal cavities, and their occurrence in such diverse locations necessarily calls for a different explanation.

It is believed today that they arise from germinal (sex) cells. As these cells are totipotent, they are considered to be set aside in an early period of development and to wander later to the gonads. On their way they may be caught in the tissue of different organs, and there, due to some stimulus, undergo development in an environment unfit for this purpose. It has been proved that fertilization per se is unnecessary to start development of the germinal cell. Loeb[2] induced parthenogenesis in the unfertilized ova of frogs with the aid of physical stimuli. Apparently normal frogs were obtained, but they possessed no sex cells. Bosaeus[3] removed an ovum from a frog, pricked it with a needle,

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†The condensed history of the patient reads as follows:

Family History.—Negative.

Past History.—Usual childhood diseases.

Case History.—Aged thirty-three years, white, married, one full-term delivery (child seventeen years old at present), no miscarriages. Menstruation started at age of thirteen years, present slight dysmenorrhea, much leukorrhea, no menorrhea. Complaint: Noticed swelling in the abdominal region in March, 1934. No symptoms except pain and discomfort when up and about, seemed to be getting larger.

Diagnosis.—Teratoma of left ovary. Probable duration two years. Wassermann reaction positive. Kahn reaction negative.

Treatment.—Panhysterectomy, bilateral salpingo-oophorectomy (by Dr. B. C. Hirst of the Graduate Hospital).

Pathologic Diagnosis.—Teratoma (by Dr. E. A. Case of the Graduate Hospital).

reimplanted it in the body of the same animal, and a teratoma developed. It seems that no place other than the uterus offers a desirable environment for undisturbed human development. The strong elastic uterine wall, the fetal membranes and fluid guard human development against pressure and sudden jolts. *Per analogiam* we may infer that when a misplaced germinal cell is stimulated in the human body, a parthenogenetic process may be brought about, resulting in a jumbled mass of tissue derived from the three germinal layers.* Such nondescript masses, which not only persist but steadily grow, which fail to fulfill a useful purpose and interfere with the economy of the human body are termed teratomas. They are usually benign, but rapid and destructive proliferations of an elementary tissue, followed by metastasis, may render them malignant.

Certain teratomas of which the tissues are well differentiated and arranged in a more or less orderly fashion are called dermoid cysts. It is not always possible to draw a sharp line between dermoid cysts and other teratomas.†

Our interest is explained by the fact that teeth and other dermal appendages may be found in teratomas. In dermoid cysts they arise from a nodular plug or projection which extends into the cyst cavity (cavities) and may be regarded as a cephalic portion of an acardiac acormus (trunkless) teratoma. As many as 300 dental elements have been found in one cyst; this is, however, an unusually large number. Also hairs, nails, horny structures, sebaceous and sweat glands, and hair follicles may arise from the skin which covers this elevation or dermoid plug.

Such teeth that are found in dermoid cysts and teratomas in general show most frequently a premolar or canine configuration, but molariform (bi- and multirooted) and incisiform types are likewise encountered. According to Steinhoff[4] the roots of multirooted teeth are often grown together.

In some cases the outline of the teeth resembles that of the deciduous series. Incompletely formed and rudimentary teeth and separate or combined structural components of teeth are occasionally found in teratomatous tissue.

The dental organs are often surrounded by a bony crypt which more or less presents the shape of an alveolus and may form part of a rudimentary jaw. Some teeth are attached in a true alveolus.

Frank[5] reported: "In one instance, on opening a dermoid, I found a unilateral mandible with a well-developed ascending ramus, condyle, coronoid process and body containing molars and incisors. There was a mandibular fossa also. I have been unable to find an actual report on the shedding of teeth in a teratoma."

Hopewell-Smith[6] stated: "There is no distinct evidence of the shedding of 'dermoid' teeth, and there is no evidence of any distinction between a deciduous and a permanent series."

In this report I shall show that in the case presented a differentiation in series, homologous to the deciduous and the permanent series, can be made.

*The teratomas of the kidney are usually derived from one or two germinal layers. They are commonly called embryomas.

†Teratologists refer to a group of parasitic monsters (fetus in fetu) and regard them as arising in the first stages of embryonal development from somatic blastomeres, developmentally segregated during segmentation of the fertilized ovum. Such parasites constitute incomplete individuals, either attached or not attached to a homologous twin.

Although the teeth found in teratomas may present anomalies in form, size and structure, the process of caries has never been observed. The enamel of the teeth in such tumors is rather normal, the dentin as a rule is hypoplastic, the cementum often absent; when present, it is thinner than usual. In the erupted specimen examined, a cuticle covers the enamel. The epithelial attachment was intact; no gingival crevice was present.

The mechanism of eruption remains an enigma in such cases where no bone underlies the heterotopic teeth. It suggests that the lengthening of the root, after all, does not constitute the only means whereby the tooth is elevated from its position in the jaw.

Description.—From the epithelial lining in the fold of a large cystic cavity, different epithelial invaginations arise which simulate either a dentogingival lamina or a lip furrow (Fig. 1). At the termination of one lamina an enamel

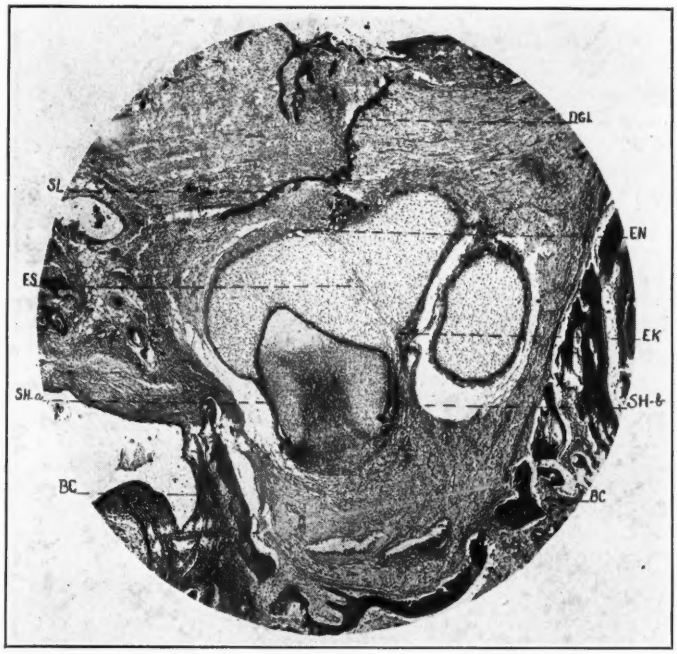

Fig. 1.—General view of a section showing odontogenesis in the lining of a cystic cavity in an ovarian teratoma. Hematoxylin-eosin staining. (Mag. 16×.) *DGL* = Dentogingival lamina; *SL* = Successional lamina; *EN* = Enamel navel; *EK* = Enamel knot; *ES* = Enamel septum; *SH* = Sheath of Hertwig; *BC* = Bony crypt.

organ is being formed. We may consider this enamel organ homologous with that of a deciduous tooth germ, as it represents the first element of a series. A separate lamina branches off from the dentogingival lamina, evidently for the purpose of forming a successional tooth. This lamina may be regarded as the homologue of the successional lamina of normal odontogenesis. Where the tooth germ is attached to the dentogingival lamina, strands of epithelial cells collectively arranged in triangular form are suggestive of the presence of enamel niches.

The enamel bud proper is of irregular outline. An enamel navel and an enamel knot can be recognized, between which epithelial strands suggest the presence of Bolk's enamel septum. In the section, this enamel septum divides

the stellate reticulum into two unequal parts. The structure of the stellate reticulum is normal. The outer enamel epithelium offers likewise no aberrant

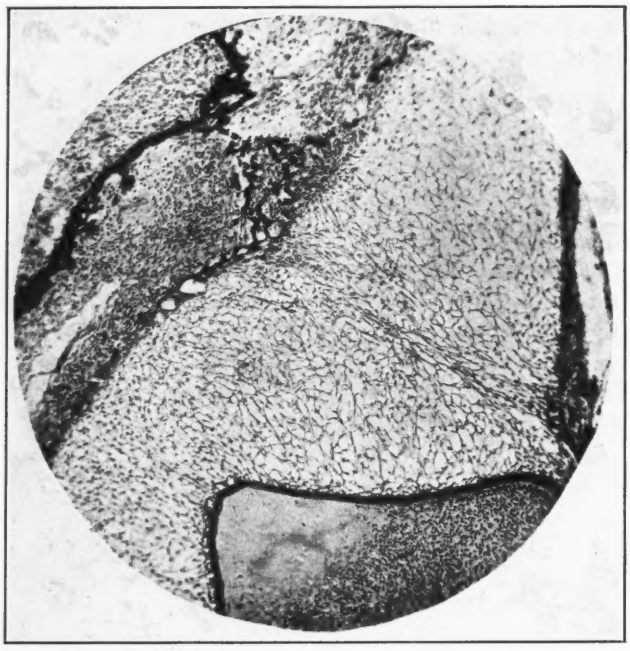

Fig. 2.—Higher magnification of part of the enamel organ, showing detail of enamel navel, knot, and septum (compare with Fig. 1). Hematoxylin-eosin staining. (Mag. 40×.)

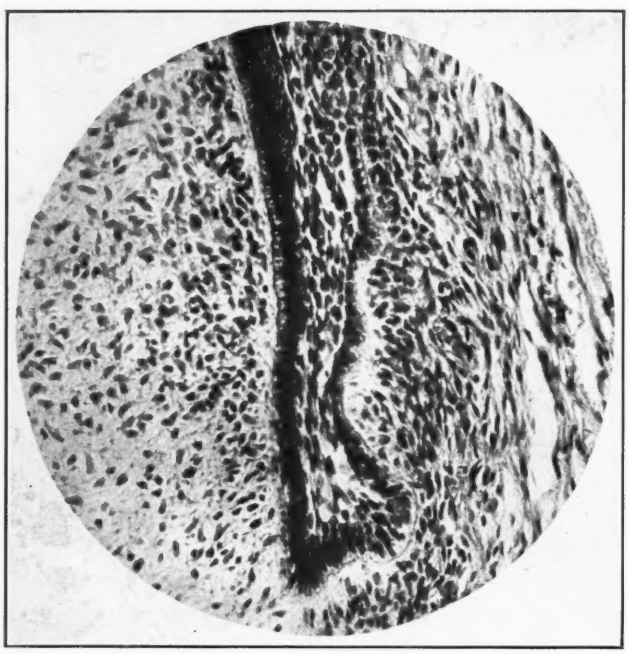

Fig. 3.—Higher magnification of Hertwig's sheath showing details of epithelial tubes (compare with Fig. 1). Hematoxylin-eosin staining. (Mag. 40×.)

characteristics. Capillaries are present in the peripheral recesses of this epithelium. In the enamel niche vascularization is conspicuous (Fig. 2). The inner

enamel epithelium has differentiated into high columnar cells. At their inner aspect a *stratum intermedium* is beginning to form. Not all cells of the inner epithelium have as yet differentiated. The inner and outer epithelium of the enamel bud have formed concentric epithelial tubes (sheath of Hertwig) which are rather normal and in close contact at one side (a) but widely separated and irregular at the other side (b) (Figs. 1 and 3). The future ameloblasts are lined by a definite basal membrane toward the dentin papilla. This membrane extends over the cells of the outer enamel epithelium which form the outer epithelial tube. The ameloblastic layer shows the following irregularities: The ameloblasts are not strictly arranged in palisades; they assume anomolous positions; their approximate parallelism is lacking in several places; here and there they form stratifications.

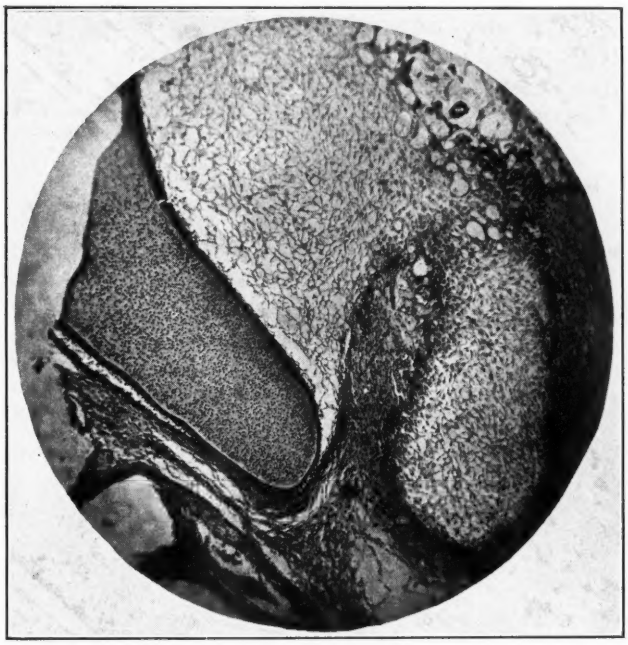

Fig. 4.—Higher magnification of Hertwig's sheath (compare with Fig. 1, *SH-b*). Hematoxylin-eosin staining. (Mag. 40×.)

The dentin papilla is well circumscribed. A comparatively large area of the dentin papilla, which occupies the deepest part of the recess in the enamel bud, shows the results of a colliquation process. This region is practically void of cells. Subjacent to this area the dentin papilla is intact. The cells are closely aggregated in the center, forming a core in which the liquefaction of tissues is in progress.

Along the lateral aspect of the dentin papilla a cell-rich area extends along the ameloblastic layer, but no differentiation is noticed in these cells. Below the dentin papilla the first indications of a dental capsule are noticed which extends upward at both sides of the tooth germ. Below the fibers of this capsule, two distended venous blood vessels appear with definite endothelial linings and partly filled with erythrocytes and blood plasma. Close to the enamel bud, and at its

right in Fig. 1 appears what seems another enamel organ in a formative stage. However, when sections are cut in another plane, it can be shown that such development may be part of the first enamel bud (Fig. 4).

The forming organs are partly surrounded by bone trabeculae, which simulate a crypt for both tooth germs.

SUMMARY

A case of odontogenesis is presented in an ovarian teratoma.

The possible etiology of teratoma is briefly discussed. The findings of such tissues which may be related to the teeth are reviewed.

A description is given of the pathologic detail pertaining to the odontogenetic tissues. Epithelial structures, homologous to those of the dentogingival and successional laminae of normal odontogenesis, are demonstrated.

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CASE OF OSTEOMYELITIS OF THE MANDIBLE, IN A CHILD, WITH PREVENTION OF SECONDARY DEFORMITY BY USE OF RETENTION APPLIANCES ON THE DECIDUOUS TEETH

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D. G., a female, white child, six years of age, was admitted to the Surgical Service of the Children's Hospital of Philadelphia on July 1, 1934, with the following history.

On June 24, 1934, one week before admission to the hospital, the child complained of a pain in the back, which was alleviated to some extent by an alcohol rub, administered by the mother. She attended school the following day but by evening complained of pain in the teeth of the right side of the mandible, and the skin in this area was reddened and swollen. The child was unable to sleep that night and became progressively more feverish, weak and listless.

By the following day (June 26) the swelling of the right side of the face became very pronounced, accompanied by complaints of acute pains in that area. Consultation with the family physician resulted in her being taken to one of the local hospitals where the application of ice packs to the right side of the face was advised. At this visit the child's temperature was 105°, and there was a discharge of pus upon the surfaces of the teeth, in the affected area. When the patient returned next day (June 27) to the previously mentioned hospital, the dental surgeon extracted two deciduous molars from the right side of the mandible. This seemed to have a definite beneficial effect, as the temperature lowered to 102° and the child slept better. This relief, however, was of short duration, and by the following day (June 28) the temperature was elevated to 104° and there was a liberal discharge of pus from the site of the extracted teeth. These unfavorable conditions persisted for three days until July 1, when the child was brought to the Children's Hospital of Philadelphia and admitted for dental consultation on the surgical service. Examination disclosed a marked swelling of the entire right side of the face. The gums were swollen and boggy on the right side of the mandible where the deciduous molars had been extracted. There still persisted a considerable exudation of pus from the sites of the removed teeth. As was anticipated, the x-ray picture was essentially negative, as it usually is in these cases, where but a short period of time had elapsed since the acute symptoms had developed. (Fig. 1.)

By persistent treatment until the following day (July 3) there was a marked fall of temperature and a definite decrease in the swelling of the face. With these encouraging signs the surgeon and the dentist decided to postpone any surgical operation, in the hope that drainage in the mouth in conjunction

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with application of cold packs to the right side of the face and routine mouth washes might be sufficient treatment. From this date until July 12 the temperature continued to fall and the patient was less toxic, but there still remained swelling and fluctuation along the lower border of the mandible. An x-ray examination disclosed on the right side of the mandible, below the first permanent molar, that the cortex was rarefied and somewhat spotty due probably to bone infection (Fig. 2). This was not seen at the first radiographic examination and had undoubtedly developed since then. As yet no sign of sequestrum formation had appeared.

Fig. 1. Fig. 2.

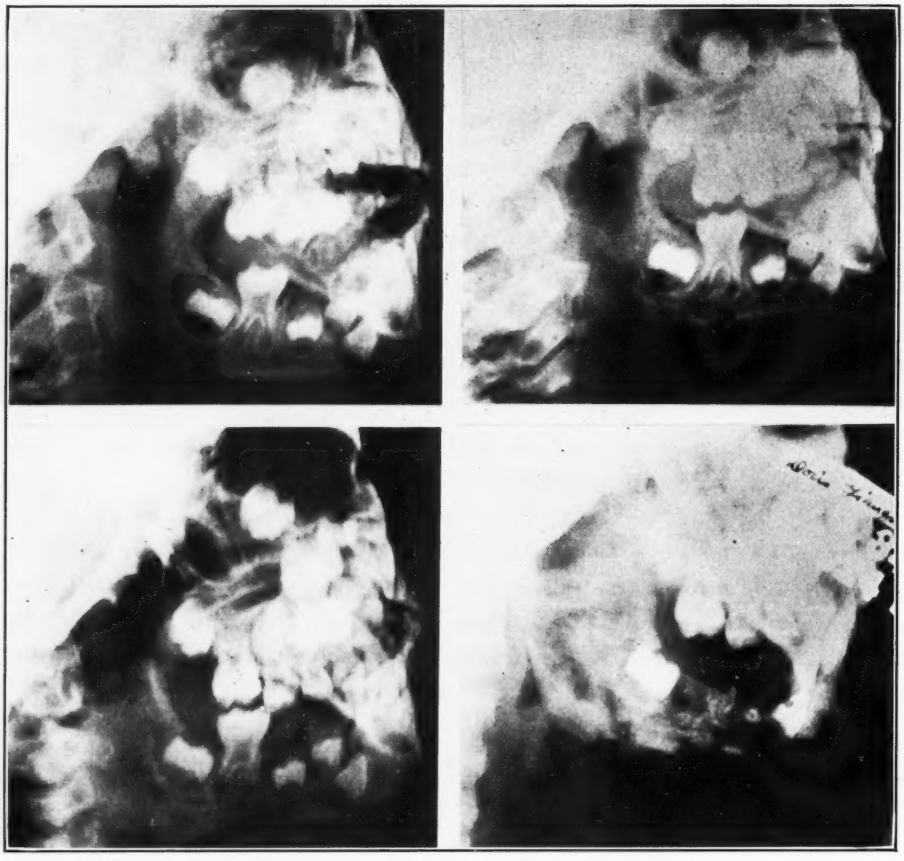

Fig. 3. Fig. 4.

It was decided at this time (July 13) to resort to surgery and the operation was performed under ether anesthesia. Incision was made below the right border of the mandible followed by an escape of a small quantity of pus. The lower border of the bone felt rough, but no loose particles were felt. A rubber dam was inserted to maintain drainage. A definite diagnosis of osteomyelitis of the right side of the mandible was now made.

For the following week, the patient continued with a low grade septic temperature, slight drainage from the incision and little subsidence of the existing swelling. An x-ray picture taken at this date (July 23) disclosed an area of rarefaction and absorption extending from the unerupted second permanent

molar to the canine tooth of the right side of the mandible (Fig. 3). The prognosis was that a sequestrum would ultimately form along the lower border of the mandible for almost its entire length.

Application of further surgery was withheld for another week, despite continuation of the swelling and limited drainage. The general condition of the patient was much improved, so that on August 2, under ether anesthesia, Dr. Ivy removed a sequestrum from the right side of the mandible, from within the mouth. Unfortunately the removal of the sequestrum resulted in a pathologic fracture of the jaw. Included in this sequestrum were the tooth buds of the permanent first molar and the first and second premolars (Fig. 4).

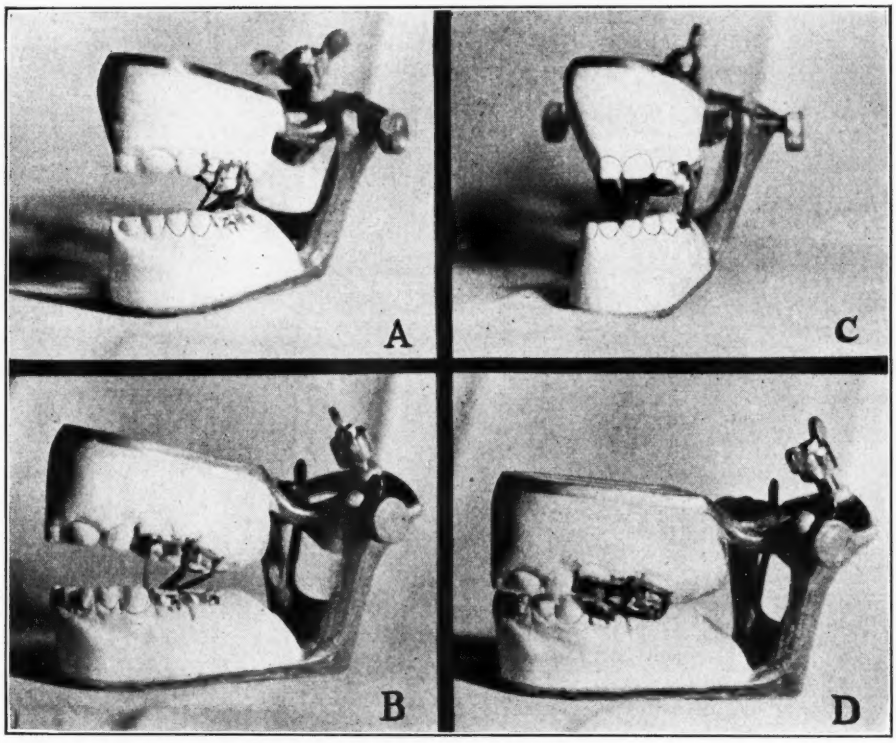

Fig. 5.

It was recommended that an appliance be made by the dental department to splint the remaining teeth and to maintain proper relationship with the maxilla during the process of healing. Due to the difference in the form of the deciduous teeth in comparison to the permanent dentition it was practically an impossibility and was deemed inadvisable to wire or splint the jaws in the normal way.

From impressions of the maxilla and the mandible of the left side, a series of individual metal bands was constructed which were cemented on the six maxillary and mandibular deciduous teeth of the left side. To each of these bands a small lingual and buccal hook was attached. (*A*, Fig. 5.)

Since the fracture had allowed the left side of the mandible to be moved toward the right side out of proper alignment, the first step was to draw the left

side back into proper position. To attain this result, we attached Angle's No. 2 orthodontic rubber bands extending from the lingual hooks of the mandibular bands to the buccal hooks on the bands of the maxillary teeth. (*A* and *B*, Fig. 5.)

In twenty-four hours the teeth came into normal occlusion, and the rubber bands were shifted to connect the buccal hooks of the bands on the maxillary and the mandibular teeth. (*C* and *D*, Fig. 5.) The child was taught to change the rubber bands when they were broken. By this means she was able to receive nourishment and at the same time maintain the position of the jaws (Fig. 6).

Thus being assured that the mandible would remain in its normal position, on Aug. 9, 1934, under ether anesthesia another external incision was made and about two teaspoonfuls of yellow pus were obtained.

Fig. 6.

Fig. 7.

To maintain drainage a rubber dam was inserted. Although the temperature returned to normal, the wound continued to drain; so upon discharge of the patient from the hospital on September 7, she was referred to the out-patient department (Fig. 7).

The discharging wound was dressed in this department until October 1, when an x-ray examination disclosed a very definite sequestrum forming along the upper border of the right mandible, anterior to the unerupted second permanent molar (Fig. 8).

A clinical examination disclosed that the swelling had increased with discharge of pus from openings beneath the jaw, and it was deemed advisable again to admit the patient to the hospital. A vast amount of satisfaction was derived from the fact that the retention appliances were maintaining a satisfactory position of the left side of the mandible.

With the patient under ether anesthesia on October 6, Dr. Ivy removed a sequestrum consisting of a large portion of the angle of the right mandible. The child was discharged from the hospital on October 9, and the draining wound was treated in the out-patient department until November 3, when she was again admitted to the hospital. A small sequestrum was removed on November 7, from the right mandible. She was discharged from the hospital on November

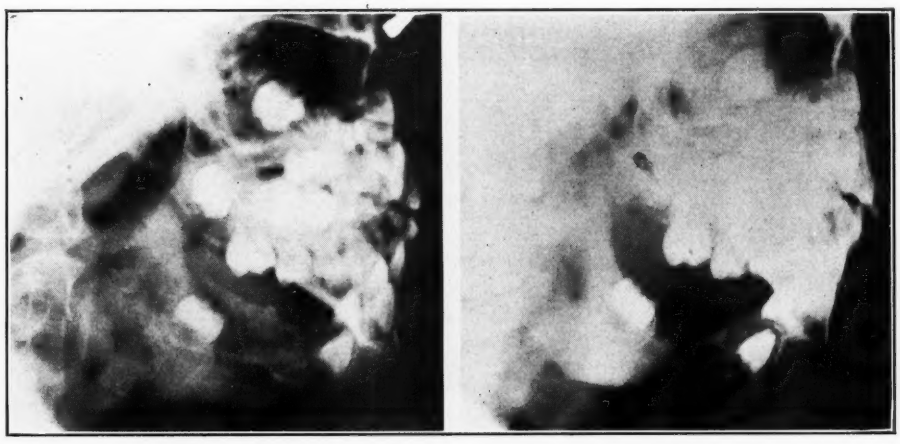

Fig. 8. Fig. 9.

Fig. 10.

11. An x-ray examination on November 27 showed a large rarefied area in the mandible lying just below the bicuspid and canine areas. Connecting this with the lower margin of the bone was a rarefied channel, evidently a cloaca. This was most likely the source of the continued drainage, although no sequestrum could be seen within the larger rarefied absorbed areas. Bone regeneration seemed to have taken place since the last examination (Fig. 9). The patient was treated for the draining wound in the out-patient department until December

16, when the retaining appliances were removed and the patient was discharged from the out-patient department. The patient was recalled on Feb. 1, 1935, for check up. The contour of the face showed much improvement (Fig. 10). The x-ray examination showed an excellent cortical thickening and calcium deposition due to the healing of the infectious process. There was, however, a small spicule of bone projecting from the border of the mandible in the involved area, which later may be discharged or possibly be the cause of continued suppuration (Fig. 11).

Fig. 11. Fig. 12.

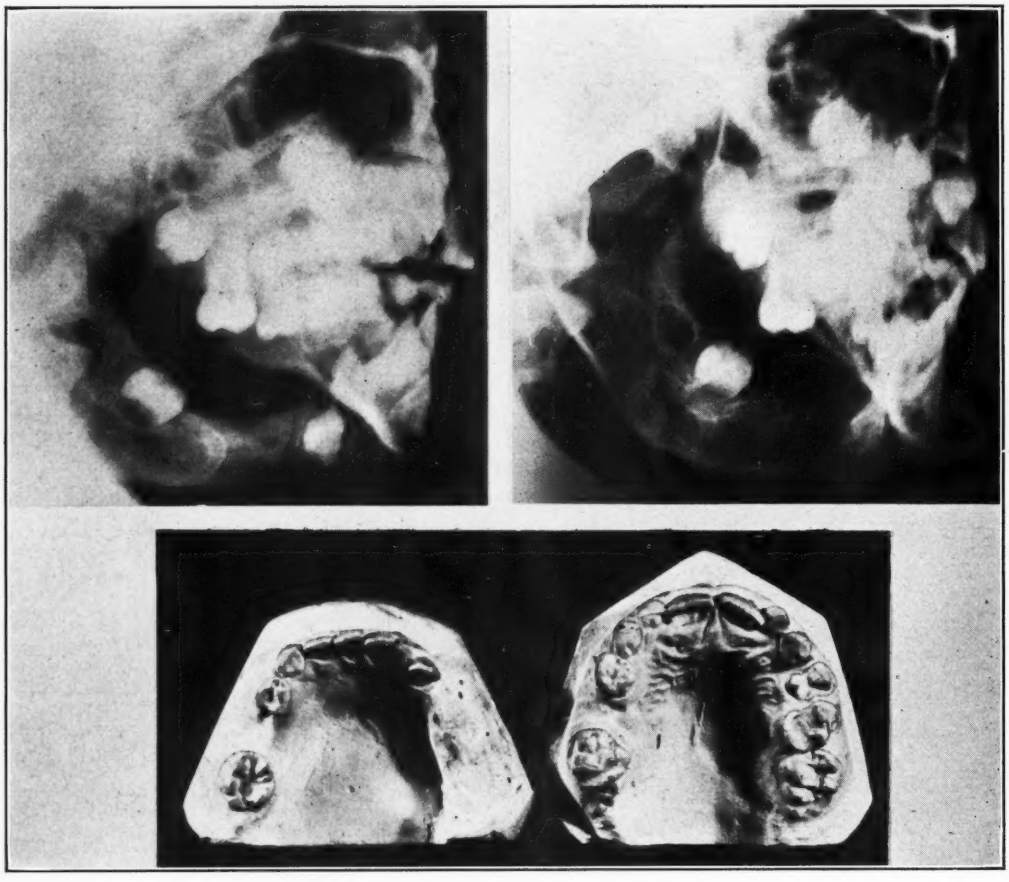

Fig. 13.

Contact with the patient was then lost because of unforeseen emergencies and existing economic conditions. By the efforts of the Social Service Department of the hospital, however, a new contact was made by the end of the year. The x-ray picture taken on December 16, 1935, showed an increase in calcium deposition (Fig. 12). Neglect had permitted several teeth of left side to become infected, and these were promptly removed to prevent any further complications.

At the present time (Feb. 15, 1936) the contour of the face has very much improved, the extent of deformity being very small in proportion to the amount of destruction. The models of the jaws show that an excellent symmetry was maintained by the appliances during the process of healing (Fig. 13). The

occlusion, while not ideal, has persisted fairly normal, most of the distortion being on the right mandible in the region of the second permanent molar, which is erupting prematurely toward the lingual.

As has been previously stated, it had been necessary to remove a number of the permanent tooth buds of the right side of the mandible. To compensate for the loss of these teeth, to stimulate bone growth, to provide proper surfaces of mastication, to prevent further drifting of the permanent canine and prematurely erupting second permanent molar, and to prevent the downward movement of the teeth of the maxilla of the right side, the child has been transferred to the Children's Clinic of the Thomas W. Evans Museum and Dental Institute, University of Pennsylvania, for further operative procedures and construction of appliances.

SUMMARY

There is a twofold purpose in the presentation of this paper. It is not to show a technic of treating osteomyelitis but rather first an unorthodox method of maintaining proper jaw relationship in the mouth of a child by the use of modified orthodontia bands, when routine procedures are not applicable and an effort to prevent marked dental deformity must be made; second, to plead for a greater stress upon preventive dentistry for children to avoid occurrences of this nature, for infrequently as they happen in the number of cases seen, the danger and the harm resulting overbalance by far any successful treatments.

FRACTURED AND INJURED INCISORS OF CHILDREN

FLOYDE EDDY HOGEBOOM,* D.D.S., LOS ANGELES, CALIF.

ONE of the most tragic and disagreeable conditions for a dentist to handle is a fractured and injured maxillary or mandibular incisor. There seems to be a tremendous number of these accidents occurring to children for various reasons. Recently I made a survey of thirty-eight actual cases taken from my files (Fig. 1). The largest number of accidents of this type occurred at eight years of age. The following is a tabulation of the age of occurrence of thirty-five cases:

AGE	NO.
6	1
7	2
8	9
9	4
10	7
11	5
12	2
13	2
14	3

Fig. 2 is a graph of these cases.

It would seem from this group of cases that age eight to ten years is the dangerous age for these accident cases. Recall the condition of the mouth at this time and you will remember that the maxillary central incisors are partially erupted. The lateral incisors may or may not be visible through the gums. The child is at the "toothy age," in other words, with two big unsupported teeth sticking out to meet anything that comes along. A radiographic study of the anterior teeth will show the roots to be incomplete in formation and with large, funnel-shaped canals (Fig. 3). The pulp may be badly exposed if the accident occurs at about this age. I have classified these fractures into the three following classes:

First Degree Fracture.—The tip is broken, and there is only a thin layer of dentin overlying the pulp to provide against thermal shock.

Second Degree Fracture.—The tip is broken, and there is only a thin layer of dentin overlying the pulp with a very near exposure.

Third Degree Fracture.—The pulp horns are exposed by the fracture.

I have discussed the care of these three types of fracture in previous papers,[1-4] so in this paper I wish to report some of the unusual difficulties encountered in some of these cases.

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It is almost impossible, from the standpoint of prevention, to guard against these conditions; a glance at Fig. 1 will give an indication of the many causes of these fractures. Supervised play may be some help; though the etiology is probably closely associated with the playful age, the fact that the teeth are prominent and unsupported by a full complement of anterior teeth and the incomplete structure of the teeth.

NAME	AGE	TOOTH	CAUSE	CLASS 1	CLASS 2	CLASS 3	VITALITY	TREATMENT	REMARKS
B.A.	10	⊔	FIGHT		I		+	GOLD CAP ZNO DRESSING	NO FOLLOW UP
N.B.	6	⊏	FALL		I		+	" " "	NO CHANGE
T.B.	7	⊏	FELL OFF BIKE		I		+	" " "	WORE CAP 1 YEAR
B.C.	8	⊏	FALL		I		+	PIN INLAY	
D.B.	10	⊔	BOXING		I		+	OPEN FACE CAP	SILICATE WINDOW
M.B.	8	⊏	FALL ON SIDEWALK		I		+	GOLD CAP	WORE CAP 3 YEARS
G.B.	11	⊐	BLOW			I	--	ROOTS FILLED	CROWNS PLACED
J.C.	10	⊔	FALL ON CURB			I	−	TREAT & FILL ROOT	PIN INLAY - SILICATE
B.E.	11	⊔	FALL		I		+	GOLD CAP 5 YEARS	PORCELAIN JACKET
T.F.	8	⊐	FALL		I			GOLD CAP	UNDER OBSERVATION
D.F.	14	⊐	SWIMMING		⊐		+	PORCELAIN CORNERS	⊔ DIED. LATER-ROOT FILLED
N.G.	9	⊏	BLOW		.	I	+	PULPOTOMY 2 YEARS ROOT DEVELOPING	
B.G.	8	⊐	RUNNING FELL		⊐		+	GOLD CAP 3 YEARS	PIN ONLAYS PORCELAIN INLAY
M.H.	13	⊏	BLOW		I		+	2 PIN PORCELAIN TIP	METAL BACKING INDICATED
G.H.	8	⊏	BLOW 3 MONTHS BEFORE			I	−	ROOT FILLED	NO FOLLOW UP
B.H.	12	⊐	SKATING			⊐	+	PULPECTOMY	GOLD BACKING SILICATE
J.J.	8	⊔	BLOW		I		+	GOLD CAP	UNDER OBSERVATION
J.K.	11	⊔ 2	HIT WITH BROOMSTICK		I		+	GOLD CAP	PROGRESS FAVORABLE
B.L.	11	⊐	FALL		I		+	PORCELAIN CORNERS	
G.I.	8	⊐	HIT WITH BALL		I		+	BAND-CAST EDGE	
J.M.	14	⊏	FALL ON CEMENT		I		+	GOLD BACKING PORCELAIN FACING 7 YEARS	WORN 7 YEARS
M.M.	8	⊏	BLOW		I		+	GOLD CAP	
J.N.	9	⊔	FALL		I		+	GOLD CAP 3 YEARS	PORCELAIN CORNER
D.P.	11	⊏	RIM OF BATHTUB		I		+	GOLD CAP	UNDER OBSERVATION
P.P.	13	⊐-2	GOLF CLUB		I		+	PORCELAIN TIPS	BREAKAGE FREQUENT
W.Q.	14	⊏	BLOW		I		+	GOLD CAP	PORCELAIN TIP METAL BACK
H.R.	7	⊏	"			I	−	CANAL FILLED WITH PASTE	EXTRACTED LATER
R.S.	8	⊓	"		I			GOLD CAP	UNDER OBSERVATION
D.S.	9	⊏	"		I		+	GOLD CAP	3 YEARS LATER PULP DIED TREATED
B.S.	10	⊐	"		I		+	GOLD CAP	PROGRESS FAVORABLE
J.S.	10	⊔	"		I		+	GOLD CAP	NO FOLLOW UP
P.W.	10	⊐	"		I		+	GOLD CAP	PORCELAIN TIPS 3 YEARS LATER
M.W.	12	⊏	"		I		+	GOLD CAP	PORCELAIN TIPS 2 YEARS LATER
C.W.	9	⊏	"			I	+	GOLD CAP	NO FOLLOW UP
DECIDUOUS ACCIDENTS									
E.G.	3½	A	FALL			I	−	ROOT TREATED	ZNO-F.C. PASTE
C.L.	3	A	FALL			I	−	ROOT TREATED	SHED AT SIX
P.L.	3	A	FALL			I	−	XEROFORM PASTE	UNDER OBSERVATION
A.V.	3½	A	FALL			I	−	ZNO-F.C. PASTE	2 YEARS SERVICE

Fig. 1.—Survey of fractured incisors.

I have had a number of very small children patients, around three years of age, who have injured the pulp of a deciduous central incisor. Each case was treated in the following way in the four cases tabulated here: The child was held on the parent's lap and the tooth opened through the lingual surface to the canal. The tooth was isolated, of course, with cotton rolls and napkins to keep the area dry. Then the canal was drained and dried out with paper points. Several treatments of Buckley's formocresol were sealed in to destroy all infec-

tion. A mixture of zinc oxide and formocresol paste was introduced into the canal for a root filling in three of the cases. I used xeroform paste in the fourth case, the formula for which is as follows:

Zinc oxide	15.00 gr.
Xeroform	5.00 gr.
Phenol	gtt. xxx
Glycerin	q. s. to make a paste

One of the difficulties is to get the paste up into the canal. Every motion must count for something done, because the child will not remain quiet for very

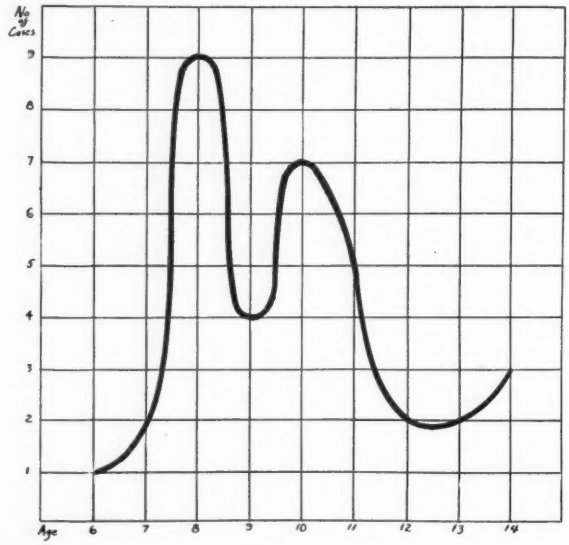

Fig. 2.

Fig. 3.

long at a time. Take an old peridental syringe (Fig. 4) with a blunt hub and fill with xeroform paste. The hub fits into the canal, and Fig. 5 shows the result of this technic. Permanent cement is then placed over the root canal filling.

The parents should take the child to the dentist as soon as possible after the accident occurs. Unfortunately the parents often take the child to an uninformed dentist, who, not knowing which way to turn, suggests that nothing be done. This might be safe advice in Class I cases, but in Class II and III cases there is a very definite technic to follow. I have already described the technic for Class II cases in two previous papers.

I suggest the following technic for Class III cases, in which the pulp is actually exposed:

1. Take an x-ray picture of the root, as this is an important differential diagnostic step.

2. The entire pulp should be removed if the root canal is complete in formation, unless the exposure is very tiny and pulp capping is indicated.

3. A pulpotomy (partial removal) is indicated if the root canal is wide open and funnel shaped, except in cases in which there is the tiniest pinpoint exposure for in those cases a capping is indicated.

This technic is not new. Davis published a book on the subject.[5] Others have handled identical cases as herein described. Anesthetize the pulp by local

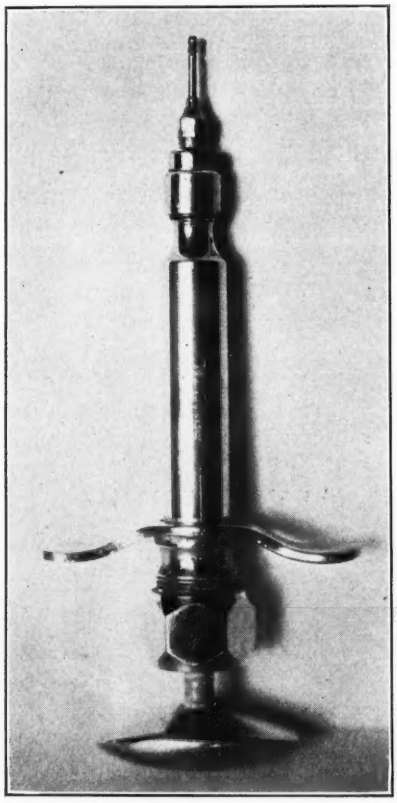

Fig. 4.

Fig. 5.

anesthesia. Isolate the tooth and cleanse it thoroughly with alcohol. Remove the pulp from the pulp chamber down to the region of the junction of the root and crown with a sterilized rose bur. Dry up the serum from the weeping canal with sterile cotton. Then tease a mixture of zinc oxide and formocresol over the stump without using any pressure. Follow this with permanent cement and a full cast gold shell crown which is to be left on indefinitely. Fig. 6 shows a case of this type. Note the developed root end and the deposit of secondary dentin near the plug of zinc oxide. Regular radiographic studies should be made of these teeth at six-month intervals. These will show the diminishing size of the canal and in some cases the depositing of secondary dentin over the amputated stump.

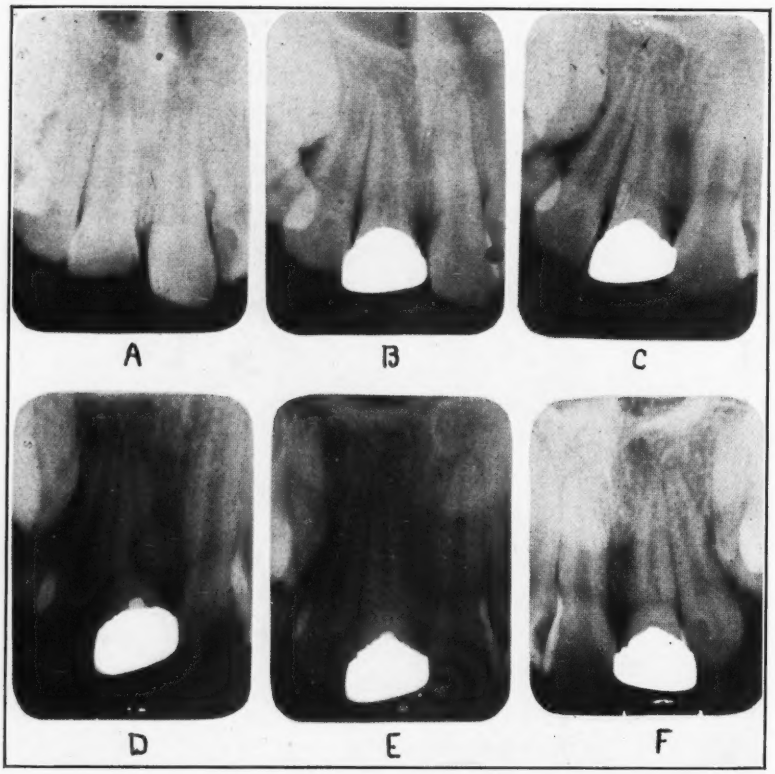

Fig. 6.—*A*, June, 1933; *B*, September, 1933; *C*, August, 1934; *D*, December, 1934; *E*, March, 1935; *F*, September, 1935.

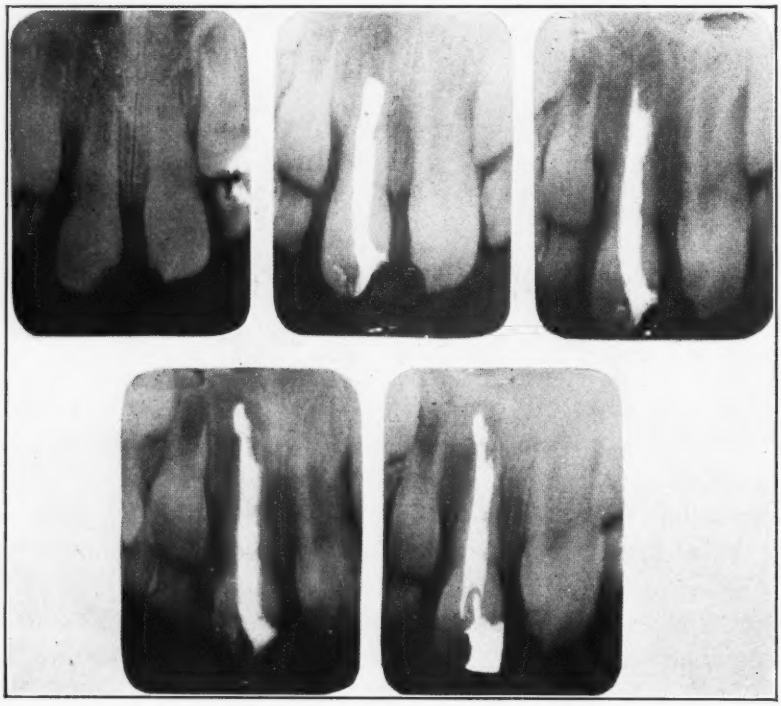

Fig. 7.

One case of this type was referred to me two or three months after the accident had happened. The pulp was putrescent, and the patient's face was swollen. The lateral incisor was as yet unerupted. Two courses were possible. The tooth could be extracted, but if this was done the lateral incisor would shift over and erupt in the line of the central incisor, so I decided to treat the tooth and retain it until the lateral incisor had erupted. Fig. 7 shows the root canal

Fig. 8.—*A*, and *B*, March, 1922; *C* and *D*, April, 1923; *E*, April, 1924; *F* and *G*, March, 1929; *H* and *I*, September, 1930; *J* and *K*, January, 1935.

after four attempts were made to fill it ideally. All this would have been unnecessary if the dentist first consulted had done a pulpotomy.

The next case, Fig. 8, concerns two incisors whose pulps were disclosed as dead when x-ray pictures were taken for diagnosis of the general mouth condition. These teeth were treated and the root canals overfilled about thirteen years ago. I am showing this case because of the complete absorption of the gutta-

percha points during that time. While we all desire to make an ideal root filling, this case shows that the body will remove this extra material if given time.

It is apparently impossible to prevent these accidents from happening; therefore the dentist must work out a full technic of how to handle these patients when they present. It is within the grasp of every dentist to know what to do, and as a health measure it is of extreme importance that he do it, and do it immediately when the case is presented.

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Department of Orthodontic Abstracts and Reviews

Edited by
DR. EGON NEUSTADT, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. Egon Neustadt, 133 East Fifty-Eighth Street, New York City.

Dental Roentgenology. By Le Roy M. Ennis, 1936, ed. 2, Philadelphia, Lea & Febiger.

The purpose of this treatise is to aid dental practitioners in "perfecting an effective technique in the exposure and development of roentgen films and to aid them in their accurate interpretation."

The first requirement of an effective technic, correct angulation, is described in a most illustrative manner. The rules governing angulation are exemplified by a series of diagrams covering every important step in intraoral roentgenology, including the occlusal film and the bite-wing film. The extraoral method is employed for examination of the temporomandibular articulation, the lateral aspect of the head, and the sinuses. For exact localization, the use of stereoroentgenology is suggested, and the method of exposure explained.

The second important step in x-ray technic is the proper development of the film. For this purpose a practical understanding of the different types of films, cassettes, and intensifying screens is needed. Furthermore, the chemistry of photographic materials should be understood; the author discusses the chemistry of development, fixation, reduction, and washing. Fortunately, he avoids being too scientific in these chapters, limiting his remarks to the fundamental facts and their practical application. His "Practical Hints for the Dark Room" are full of valuable information.

After exposure and development, the third major requirement presents itself in the correct interpretation of the x-ray film. Ennis realizes that an indispensable factor in diagnosis is the understanding of pathology. For this reason he devotes the longest chapter of his book to dental pathology in relation to roentgenology. Without too much stress on purely histopathologic considerations, all the important pathologic conditions are here to be found, correlated to their roentgenologic manifestations: periapical lesions with the different types of rarefying osteitis; periosteal abscess and condensing osteitis; secondary dentine and degenerations of the pulp; root absorptions, external and internal; cement hyperplasia; odontoma; caries; impactions; residual roots.

A welcome addition is the chapter on routine examination of the oral cavity, which includes the electric vitality test, the thermal test, transillumination, and roentgen film illumination for easier interpretation.

Orthodontists and dentists who take their own x-ray pictures will find this book a valuable addition to their libraries and a real help in their roentgenologic work.

E. N.

La Technique des Aciers Inoxydables. Le Soudage Electique. By Maurice Charlier. Brussels, 1935, J. E. Goossens.

The book deals with the technic of using stainless steel for dental purposes and with the method of soldering by means of electricity. It is entirely practical in its nature, describing the laboratory methods of constructing prosthetic and orthodontic appliances from nonoxydizing steel. The orthodontic appliances demonstrated are used in the Belgian College of Dentistry in Brussels (L'Ecole Dentaire Belge a Bruxelles), where Charlier teaches in the capacity of professor. The author's technic is highly advanced. Each step is standardized, described in detail, and illustrated; the making of bands, the construction of main arches and locking devices, and the addition of various kinds of auxiliary springs. The electric soldering is done with a special dental soldering machine made by a Belgian concern, which manufactures a fixed as well as a portable type. Their use is shown on both stainless steel and precious metals.

The book is written in French; it contains 243 pages, with 280 illustrations, and is handsomely gotten up.

E. N.

The Forum

Articles for this department should be sent to Dr. William R. Humphrey, 1232 Republic Bldg., Denver, Colo.

Continuing the Discussion of Chrome Alloy

In the Forum of the April issue of this Journal, Dr. A. B. Brusse of Denver takes me to task for my article on stainless steel, published in the *Journal of the American Dental Association* in December last.

It is unfortunate that Dr. Brusse should have allowed his judgment to be so disturbed by what he calls my bitter attack upon stainless steel, and questioning the intelligence of the orthodontists who are using chrome alloys. It is quite evident from a review of Dr. Brusse's discussion that he really is not so much interested in the text of my article as he is violently opposed to any one who may differ with him regarding stainless steel. Evidently Dr. Brusse loses the point which I stress, that stainless steel be not substituted for precious metals. At no time did I state that I felt that stainless steel should be eliminated from the field of orthodontics. Dr. Brusse's misunderstanding of my article clearly shows that he feels that at last a material has been found which is ideal and that all precious metals can be thrown into the wastebasket. I regret that the doctor could not have kept the discussion on an ethical basis, but found it necessary to inject a statement that I was a party to a scheme of some commercial concern for advertising precious metals. If any house manufacturing precious metals used my article for advertising purposes, it did so without my knowledge or consent.

My authority for the statement that stainless steel dates back to the middle of the eighteenth century is based upon information obtained from brochures furnished me by steel companies manufacturing stainless steel.

I repeat that chrome alloy is extremely susceptible to electrolysis, and this is based not only upon researches of steel companies, but upon my own experiments with galvanic current.

Near the end of his article, Dr. Brusse stated that soldering stainless steel is a failure, and that we must resort to spot welding. Spot welding is one of the most awkward and inconvenient methods of attaching parts. Once a tube is spot welded to a molar band it is impractical to realign it. I have seen a number of stainless steel appliances in the mouths of patients from men who have become expert in spot welding. I do not question but what such appliances are clean and enduring, but from merely observing these appliances I am more than ever convinced that there is an enormous loss of time in spot welding this

material. I question the statement of Dr. Brusse that "the operator will be rewarded by the saving of three-fourths of his operating time."

In concluding, I observe that Dr. Brusse carefully avoids any mention of my statement that stainless steel, unlike the platinum gold alloys, loses its temper when heated to a soldering temperature.

I shall submit more evidence of my contentions at a later date.

Percy Norman Williams.

International Journal of Orthodontia and Oral Surgery

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 3523-25 Pine Blvd., St. Louis, Mo.

Foreign Depots—*Great Britain*—Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

Subscription Rates—Single Copies, 75 cents. To any place in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $7.00 per year in advance. Under foreign postage, $7.40. Volume begins with January and ends with December of each year.

Remittances—Remittances for subscriptions should be made by check, draft, post office or express money order, payable to the publishers, The C. V. Mosby Company.

Contributions.—The editor will consider for publication original communications of merit on orthodontic and allied subjects, which must be contributed solely to this Journal. Original, double spaced, typewritten copy should be submitted.

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Reprints—The publishers will communicate with authors regarding reprints upon publication of papers.

Communications—Contributed articles, illustrations, letters, and all other matter pertaining to the editorial department should be addressed to the editor, Dr. H. C. Pollock, 4482 Washington Blvd., St. Louis, Mo. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 3523-25 Pine Blvd., St. Louis, Mo.

Illustrations—Such half-tones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

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Entered at the Post Office at St. Louis, Mo., as Second Class Matter

Editorial

American Society of Orthodontists

TIME marches on and the thirty-fifth annual meeting of the American Society of Orthodontists, which was held in St. Louis April 21-24, is now past history. Assembling in the city of St. Louis more or less marked a home-coming, inasmuch as a small nucleus of pioneers interested in the promising infant science called orthodontia assembled in St. Louis thirty-five years ago for the creation and launching of the American Society of Orthodontists. Those who assembled at that time, with such enthusiasm and abiding loyalty to a new department of health service, little realized that their group was destined to grow aggressively to be the largest and most creative society for the study of malocclusion in the world! It is interesting to recall the men who sponsored

the organization at that time. Without doubt, inspiration came from the late Dr. Edward H. Angle and Dr. Richard Summa, both of St. Louis, who, with the support of students and protégés, organized the society. Those present were: Milton T. Watson of Detroit; Herbert Pullen of Buffalo; Frank Gough of New York; Lloyd Lourie of Chicago; Grafton Monroe of Springfield, Ill.; Fred C. Kemple of New York, and H. E. Lindas, T. B. Mercer, and William Rafter. These men set as their goal to enhance the understanding and to promote the study of malocclusion of the teeth. Dr. Angle, at that time an international figure in orthodontia, became the first president, in which capacity he served for two years; he was then succeeded by the late Milton T. Watson. Since the organization was launched, more than half these men have passed on; however they, and those who are living, have given an important heritage to posterity which has proved to be one of the most meritorious health services for children and has built for itself the prestige of being the most highly specialized department of dentistry.

The St. Louis meeting this year opened on April 21 with the annual Golf Tournament, held at Sunset Hill Country Club; about sixty members of the Society participated. Trophies were awarded at the Stag Dinner, which was held immediately after the nineteenth hole. Awards were made to the following men: Dr. Conley of Dallas, Texas; Dr. Joseph E. Eby of New York City; Dr. Jesse Keeney of Quincy, Ill.; Dr. Gerald Franklin of Montreal; and Dr. O. W. White of Detroit.

The scientific sessions of the meeting were unusually well attended. They stressed the modern concept of orthodontia as a science. As a result of the inspiration of the papers of the meeting, it is interesting to recall the past and to refer to some things written many years ago. For instance, on the subject of etiology of malocclusion, the late Martin Dewey in commenting on a paper appearing in the *Dental Cosmos* wrote editorially that "the abnormal pathologic development of the bones of the face in which the teeth are located is generally the result of faulty development of the child from birth, or probably before birth. This is very probably the more scientific explanation of the cause of a large number of malocclusions than it is to attempt to explain all malocclusions by one or a very few etiologic factors." Nineteen years ago, Dewey wrote: "We do not believe that the solution of etiology will be found by limiting ourselves to the study of any one condition or by making positive statements that mouth-breathing produces all malocclusions. . . . We believe that great advance will be made when the profession realizes that malocclusions are really a pathologic problem and a great many of them have their beginning at a time when it is impossible to recognize them from a mechanical standpoint. It must be remembered that in the treatment of malocclusions we are not dealing entirely with a mechanical problem, but are dealing with a biologic one in attempting to produce biologic growths according to such methods as we can employ. The sooner the orthodontic profession realizes that constitutional disturbances and faulty developments are factors which must be met and studied, the sooner will it make the advance to which it is entitled and receive the recognition from the medical profession it should receive."

It is quite truly said that history repeats itself! One could easily obtain the impression from cross-section of the papers of the St. Louis meeting of the trend of thought that the head, the skull, and the face are evolved from living, pulsating sources, highly sensitive in shape, form, and position to growth hormones, nutrition, environment, and heredity. The papers indicated the wide variability of the mandible in shape and reflected it as a hinge-appendage attached to the skull, having the attribute of vertical movement in excursions up and down for the purpose of masticating food, and that the shape of the organism has much to do with the human countenance, which is ever in the making. Things mentioned and written about twenty or thirty years ago are now becoming important in the orthodontic problem.

To report adequately on the excellent papers and clinics given at this meeting would take more space than is available here; nevertheless, the readers of the INTERNATIONAL JOURNAL OF ORTHODONTIA AND ORAL SURGERY are urged to watch the pages of the Journal during the remainder of this year, in order that they may not miss some of the valuable and interesting work contributed to orthodontia at the St. Louis meeting.

Those elected to office in the American Society of Orthodontists for the coming year are: Paul G. Spencer, Waco—president; James D. McCoy, Los Angeles—president-elect; F. A. Delabarre, Boston—vice president; Claude Wood, Knoxville—secretary-treasurer; Albert Crosby, New Haven—president of the American Board of Orthodontia; and Frederick Murless, Hartford, Connecticut—new member of the American Board of Orthodontia. A new Socio-Economic Committee was appointed: T. W. Sorrells, Oklahoma City; Harry Allshouse, Kansas City, Missouri; and Russell Irish, Pittsburgh. The purpose of this Committee will be to make recommendations pertaining to orthodontic practice and its relation to present-day trends of all health service. After survey and study it is thought the Committee will recommend ways and means of extending service to wider brackets of the people than are receiving it at the present time.

On an invitation extended by the Chicago orthodontists, it was voted to hold the next annual meeting at Chicago in April, 1937.

H. C. P.

News and Notes

Texas State Dental Society

The Fifty-Seventh Annual Meeting of the Texas State Dental Society will be held in Dallas, August 31 to September 4, in conjunction with the Texas Centennial Exposition. Postgraduate courses will be offered in the four major branches of dentistry by twelve nationally known clinicians. For information, address Dr. J. G. Fife, secretary of the Texas State Dental Society, Medical Arts Building, Dallas, Texas.

American Society for the Promotion of Dentistry for Children

The annual meeting of the American Society for the Promotion of Dentistry for Children will be held in the Francis Hotel, San Francisco, Calif., on July 13 and 14, 1936. Interesting and helpful papers, table clinics, and practical demonstrations will be given covering all phases of dentistry for children. A round table luncheon will be held on Monday, July 13, at 12:30. All sessions will be held at the Francis Hotel, and every member of the American Dental Association and the Canadian Dental Association will be most welcome.

WALTER T. MCFALL, President.
JOHN C. BRAUER, Secretary.

American Dental Assistants Association

The twelfth annual meeting of the American Dental Assistants Association will be held in San Francisco, Calif., July 13 to 17, 1936. Headquarters will be at the Hotel Whitcomb. For further information please address

LUCILE S. HODGE, General Secretary,
401 Medical Arts Building,
Knoxville, Tenn.

British Empire Dental Meeting

The British Empire Dental Meeting will be held in London during the last week of July. A large delegation of Canadian dentists will be in attendance and will leave Montreal on July 10. Dr. Fred J. Conboy of 86 Bloor St. W., Toronto, Ontario, is chairman of the Arrangements Committee.

Postgraduate Course in Periodontia at New York University College of Dentistry

The New York University College of Dentistry will hold its third annual postgraduate course in periodontia for two weeks, full day; or for four weeks, mornings only, beginning July 6, 1936. Courses are limited to fifteen men.

The course will include etiology, diagnosis, and treatment of periodontal disease. Various technics of pocket eradication will be considered and conservative treatment stressed. Vincent's infection; diagnosis of types of bone resorption; mouth manifestations of systemic disease; periodontal foci of infection; toothbrushing; instrumentation; balancing of occlusion. Taught by lectures and clinical work, each student treating several cases.

Instruction by Drs. Samuel Charles Miller, Sidney Sorrin, J. Lewis Blass, and the entire periodontia faculty.

For information and application, address Periodontia Department, New York University College of Dentistry, 209 East 23rd Street, New York, N. Y.

SAMUEL CHARLES MILLER,
Associate Professor of Periodontia.

Ninth International Dental Congress of the F. D. I. in Vienna

In Vienna, Austria, from August 2-8 inclusive, the Ninth International Dental Congress of the Federation Dentaire Internationale will be held.

American Association of Women Dentists

The American Association of Women Dentists will meet at San Francisco, July 13 to 17.

DR. VIRGINIA TREMBLY,
317 Burns Building,
Colorado Springs, Colo.

Omicron Kappa Upsilon

The members of Omicron Kappa Upsilon will meet for a good fellowship luncheon at the St. Francis Hotel, San Francisco, during the meeting of the American Dental Association to be held in that city July 13-17, 1936.

Dr. Fred T. West of 2595 Mission Street, San Francisco, is chairman of the local committee in charge of the luncheon.

ABRAM HOFFMAN,
Supreme Secretary-Treasurer,
311 East Chicago Avenue,
Chicago, Illinois.

American Dental Association

The Seventy-Eighth Annual Meeting of the American Dental Association will be held at San Francisco, California, July 13 to 17, inclusive.

Presentation of Certificate from American Board of Orthodontia

Complimenting Dr. Oscar E. Busby, a score or more members of the Southwestern Society of Orthodontists, from Oklahoma and Texas, attended the May 12 meeting of the Dallas County Dental Society, at which time Dr. Busby was presented with his certificate from the American Board of Orthodontia.

The Southwestern Society of Orthodontists appreciates the cooperation of Mr. R. V. Williams of the Williams Gold Co., who brought Dr. Oren A. Oliver of Nashville, president of the American Board of Orthodontia, and Dr. Claude Wood of Knoxville, secretary of the American Society of Orthodontists, to Dallas in his private plane, thereby making it possible for the certificate to be presented personally by the president of the American Board.

Notes of Interest

Dr. Lowrie J. Porter announces the removal of his offices to the Fuller Building, 41 East Fifty-Seventh Street, New York, N. Y., for the practice of orthodontia.

Dr. Richard C. Beatty announces that he is assuming the practice of the late Dr. Ralph P. Howarth. He is retaining offices at 1140 Hanna Building, Cleveland, Ohio. Practice limited to orthodontia.

Erratum

Kurt H. Thoma alone is the author of the article "Cyst of Papilla Palatina" on p. 521 of the May issue of the Journal. Dr. Thoma's title is Charles A. Brackett Professor of Oral Pathology, Harvard University Dental School.

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